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INFLUENCE OF SUN-WORSHIP ON LATER RELIGIONS.

THE phenomena of the development and of the decay of Sabaism alike bear on our interpretation not only of the past, but of the present of religion, and even on our anticipations in regard to its future.

It must have seemed clear to those who in past ages noted what the heavenly bodies seem to do and to be, that in those orbs they had recognised real powers, influencing in all-important degree the fortunes of men and nations, nay, of the whole earth. The belief and the ritual arising from this belief, the most widespread and indeed the noblest of all forms of nature-worship which civilised races have ever accepted, were the product of too many generations of thinking men, and related to too complicated a series of observed facts to be lightly thrown off even when the more observant began to perceive that the phenomena which had seemed to indicate individual power in reality are the product of continuously acting law. With the student of science in our time change of view means only the admission of previous error in regard to physical phenomena. But at the time when men first perceived that they must change their ideas in regard to the heavenly bodies, that meant for them the rejection of what had been regarded as intimately associated with the well-being of the individual man, of the race, of whole nations of races, nay, of mankind itself.

It had been held to be a solemn duty to offer daily prayers and sacrifices to the sun-god at his rising and setting, and yearly to rejoice at his new birth, at his triumphant resurrection above the equator, and at his ascension towards the fulness of his summer glory; which, as he passed thence towards the decay of his powers in autumn, rejoicing gave way to anxiety (even while the autumn fruits were gratefully collected), and anxiety to lamentation as the gloom of winter approached and deepened. In like manner the monthly movements of the moon, considered separately or connected with the varying glory of the sun, had been the occasion of observances which were directly associated with the well-being of the race. Planets and stars had taken their place in the system of observance, in various ways according to the various ideas of different nations, but with a certain resemblance between all the different cults such as might be expected from the circumstance that the objects worshipped were the same for all, and the ideas underlying the various systems of ceremonial in the main identical.

Thus can we understand, even apart from any theory of interchange of ideas between various races (though doubtless such interchange took place), how Indians, Babylonians, and Egyptians (Japhetic, Semitic, and Hammite), to say nothing of Chinese, Mexicans, and Peruvians, shared those broader religious ideas which sprang naturally from the worship of the heavenly bodies. We can see also why they had, in the main, the same notions about many matters of detail which at a first view seem merely fanciful.

Thus among all ancient races which attained any high degree of civilisation we find the idea of contest between light and darkness regarded as powers. We find light associated with good and darkness with evil. Darkness triumphs for a while over light, but light is always restored, precisely as night triumphs over day but day returns, and as the gloom of winter absorbs the glory of the sun but the sun is born again and grows again to power. The short-lasting victories achieved by night over day early lost their terrors. Men soon learned that the sun would surely return day after day to be their light and life. But it was otherwise with the mystery of the sun's annual death. Less easily interpreted, the fears it brought were less easily removed. Yet here also men learned that the victory of darkness is but temporary. The darker half of the celestial sphere imprisons the sun for a while; but though he is transpierced as he crosses the equator, yet on the third day from that on which his orb first touches the equator it has risen wholly above it.* This would be true for all parts of the earth and for all time; but many details of the sun-god's career would differ slightly, as supposed to be read in the stars, at different places and at different times. For the aspect of the zodiacal constellations, especially at rising and setting, differs with the latitude, at any given time, and the critical parts of the sun's career, his solstices and equinoxial transits, occupy different parts of the zodiac as the earth's precessional movement carries these parts backwards among the signs. The first consideration is not of any great importance, though there was a somewhat wide range of latitude among the chief civilised nations of old times; but the effects of precession affected, of course, critically the apparent significance of the sun's yearly journey. In about 2,150 years the equinoxes and solstices are carried backwards through a whole sign. Thus the vernal equinox, now in Pisces, was in Aries 2,150 years ago, in Taurus 4,300 years ago, and in Gemini 6,450 years ago. The summer solstice now in Gemini was in Cancer for 2,180 years, in Leo as long before that, and before that for 2,150 years in Virgo. When the sun is rising at the winter solstice now, or say on December 25, which in all the old systems was the date of the sun-god's annual birth, he is in the constellation Sagittarius, and the constellation Gemini is setting in the north-west; but 2,150 years ago he was in Capricornus and Cancer was setting; 4,300 years ago he was in Aquarius and the Lion was setting; while 6,450 years ago he was in Pisces, and the Virgin, with upraised arms (marked by the stars β, η, γ, δ and α), was setting in the north-western hills.

Not to dwell in detail on a number of astronomical peculiarities which would certainly influence the ideas mythically associated with a sun-god, let us consider a few of the more striking, and inquire how far they appear in the myths of India, Babylonia, Egypt, and other ancient nations which, at one stage or other of their religious development, unquestionably worshipped the heavenly bodies.

In the first place, the conception and birth of a sun-god, even if not associated with a constellation regarded as

* The sun's diameter at the spring equinox has not differed much from 32′ within the last ten thousand years (a period which would cover probably the beginnings of all known Sabaistic religions). His rate of crossing the equator is about $59\frac{1}{2}$ seconds of arc hourly, so that his disc is on the equator about $32\frac{2}{3}$ hours. If he began the crossing, for example, on Friday at noon, he would rise on Sunday, the third day, clear of the equator.

representing a virgin—as Virgo, among the nations named, assuredly did (be the explanation what it may)—would necessarily be understood to be unlike that of an ordinary being. The Supreme Being, or the Heaven Father, would be regarded as having begotten the sun-god of a virgin mother. We find this idea in all the ancient myths of the sun-god, and later it appears naturally in myths relating to divinities, or to persons of divine origin.

Osiris, of whom Murray, in his "Manual of Mythology," speaks as the Egyptian Saviour, was regarded as a virgin-born god. But he was also the father of Horus, more justly regarded as the Egyptian Saviour; and Horus was born of the virgin Isis, whose symbol (as later that of the Virgin Mary in Catholic churches) was the crescent moon.* She was, however, associated also with the Virgin of the Egyptian zodiac, and indeed in the earliest pictures of the zodiacal signs Virgo is shown as Isis. On this point the Arabian astronomer Abulmazar says, "One sees in the first Decan of the sign of the Virgin, according to the most ancient traditions of the Persians, Chaldeans, Egyptians, of Hermes and of Esculapius, a chaste, pure, immaculate virgin, of a beautiful figure and an agreeable face, having an air of modesty, holding in her hand two ears of corn, seated on a throne, nourishing and suckling a young child." Around is generally a framework of lotus-flowers. In passing it may be noted that, as Isis had brought Horus to the earth, he in return took her with him to heaven after his victory over death.

Ra, another Egyptian representative of the sun, was also a virgin-born deity. He came from the side of his mother (as we learn also happened in the case of the Buddha). Later the Egyptians came to regard their kings as of a divine nature, and attributed to them also a miraculous origin. Renouf, in his "Religion of Ancient Egypt," p. 161, says that "the Egyptians believed that their ruling sovereign was the living image and vicegerent of the sun-god (Ra). He was invested with the attributes of divinity," and Ra was regarded as his father, the mother remaining virgin.

In India many Avatars, or incarnations of Vishnu—the second person of the India *Trimurti* or Trinity—are recorded, insomuch that the Indian pundits (Moor tells us in his "Pantheon") rather despise their English rulers as being of so recent a race that they know of only one Avatar. In each case the new-born god had a virgin mother.

Crishna Jezeus was the eighth, and, according to many, the greatest of the Avatars; for while it was held that in the seven preceding incarnations a portion only of the deity was communicated, in this Vishnu himself descended in all the plenitude of the godhead. Crishna was born of Devaki, a chaste virgin. Vishnu proclaimed his intention to thus visit the earth "to relieve the oppressed world from its load," on which a chorus of angels sang aloud. In the birth-throes of this famous woman all nature shall have cause to rejoice. "Eulogised by the gods," says the Vishnu Purana, "Devaki bore in her womb the lotus-eyed deity, the saviour of the world." "The divine Vishnu himself," says the same sacred book elsewhere, "adored by Brahma and all the deities, he who is without beginning, middle, or end, being moved to relieve the earth of her load, descended into the womb of Devaki, and was born as her son; Vasu deva—that is, Crishna." Later this Purana remarks that "Crishna is the very supreme Brahma, though it is a mystery how the Supreme should assume the form of a man."

All this, however strange it may seem to us, was the natural product of a religion which originally involved the worship of the sun as the Supreme God. The ever-recurring new birth of the sun-god merged naturally into the doctrine of the incarnation, at longer intervals, of a deity of whom the sun was regarded in later times as only the symbol. A saviour, or even a teacher, who had not that sign of divine origin which the sun-god had possessed would have had small chance of being received with due veneration among races who still retained all the superstitions of sun-worshipping days.

The next among the virgin-born saviours—the ninth Avatar—among the Indians was Buddha, born of the virgin Maya (estimated date about 500 B.C., following the eighth Avatar by about 700 years). In a dream, Maya saw a white elephant, emblem of the sun, enter her right side. The dream was interpreted to signify that the child which should be born to her should be the chief of all the world, the Buddha, "able to save and deliver the world and men from the deep sea of misery and grief." This at least was the account developed in later times; doubtless there was a real Guatama whose birth was as natural as that of all other men. But when he took his place, after time enough had elapsed for the real events to be forgotten, among the deified benefactors or teachers of the past, he was held to have had that characteristic origin which the sun god of earlier ages had had, and which every deity who was to receive the veneration of the world was bound (in those times at any rate) to have. (A certain advancing keenness of ideas is shown by the circumstance that the Grand Llama, though vicegerent of God and representative of the Buddha on earth, is not at present regarded as necessarily a virgin-born being, as the Egyptians expected their king to be.)

The Siamese had a virgin-born saviour, Codom, who was placed by his mother in the folds of a lotus, and growing up became a marvel of wisdom while still a boy. The date of this divinity's miraculous birth is not recorded.

The Chinese had a number of virgin-born deities, chief among whom must be reckoned Fohi or Fuh-he, born 3468 B.C., the story of whose miraculous conception somewhat startled the Jesuit missionaries who first visited China, for they found the miracles they had trusted in as their best evidence counterbalanced by the much more ancient miracles related of Fuh-he. As with Horus, Vishnu, and the rest, the lotus appears in the Chinese story; indeed, a favourite account of Fuh-he's conception attributes it to the swallowing of the lotus coral fruit by his maiden mother—another form, no doubt, of the idea that the lotus was sacred to the sun-god.

Among the Greeks and Romans the idea of virgin-born divinities and heroes was so common that probably no new religious teaching presented to them without this accompaniment would have had any chance of acceptance. This was recognised by Justin Martyr in his famous and singularly suggestive "Apology," addressed to the Emperor Hadrian, in which he says, "We Christians, in asserting the doctrine of the Incarnation, say no more than you Pagans assert of those whom you style the sons of Jupiter;" and elsewhere he touches particularly on the case of Perseus, son of Zeus by a virgin mother, and honoured as a god at Athens. For, says Justin, "as to Jesus Christ's being born of a virgin, you have your Perseus to balance that." Of Mercury also, the son of Zeus, and a mortal mother Maia, and to whom a magnificent temple was raised at Cyllene, in Arcadia, the same Christian apologist remarked,

* Dr. Inman, in his "Pagan and Christian Symbolisms," remarks that the Virgin shown as the Queen of Heaven, nursing the infant, and associated with the "crescent moon," could not be more completely identified than she thus is with the Egyptian Isis and Horus. Higgins, in his "Anacalypsis" (vol. i. p. 304), points out that Isis was represented standing on the crescent moon with twelve stars surrounding her head. If an ancient Egyptian returning to this earth, as ancient Egyptians supposed they would, could travel through Europe his heart would be rejoiced by the sight of many thousands of pictures which he would regard as representing Isis and Horus, with their stars and moon.

"You Pagans have your Mercury, whom you worship under the title of the Word, and as a messenger from God."*

But there were many other virgin-born divinities and heroes in the Greek and Roman Pantheon. Apollo, who was unmistakably a sun-god, was the son of Zeus and a mortal mother, Latona. "At his birth there was joy," we are told, "among the immortal gods on Olympus, and the earth rejoicing laughed beneath the smile of heaven." Bacchus, another sun-god (for as there are many summers so were there many sun-gods), was of similar origin. He himself proclaims in the Bacch of Euripides, "I (am) Bacchus, son of Zeus (whom Semele, daughter of Kadmus, brought forth), having taken a mortal form instead of a god's." So with Æolus, Prometheus, and a host of others, as Justin Martyr ironically said, "a parcel of sons" were assigned by the writers most in vogue among the Greeks and Romans to Zeus or Jupiter, chief of the pagan gods.

In Mexico, Quetzalcoatl was a virgin-born god, as were Zama of Yucatan, Bochica among the Columbians, Manco Capac in Peru, and a host of others.

Passing from the conception to the birth of the ancient sun-god, we recognise other attributes which were naturally possessed by such a deity, regarded as representing the supreme God of Sabaoth or Ruler of the Heavenly Host.

(*To be continued.*)

ETNA'S ERUPTIONS.

THERE is a marked contrast between the circumstances of the eruptions of Etna which have taken place this year and in the summer of 1879, and those of the great eruption of 1868. For before the two last eruptions, the great South European volcanic system had shown but few signs of disturbance, and those only slight. But when in November 1868 Etna burst into eruption, the volcanic system of Southern Europe had been disturbed during thirteen months by subterranean movements. Scarcely a single portion of the wide area included under that name had been free from occasional shocks of earthquake. There had been shocks at Constantinople, at Bucharest, at Malta, and at Gibraltar. Mount Vesuvius, the most active though not in all respects the most important of the outlets by which that system finds relief, had been in a state of activity during the whole of the preceding year, and three several times in actual eruption. But it had seemed as though Vesuvius—owing perhaps to changes which had taken place in its subterranean ducts and conduits—had been unable to give complete relief to the forces then at work beneath the southern parts of Europe. Whenever Vesuvius had been quiescent for a while during 1868, earthquakes occurring at far-distant places not only showed the connection which exists between the action of Vesuvius and the condition of regions far remote from Vesuvius, but that the great Neapolitan outlet was not able to relieve as usual the remote parts of that wide volcanic region. Even in England and Ireland there were earthquakes, at times corresponding significantly with the temporary quiescence of Vesuvius. In fact, scarcely ten days had passed after the occurrence of an earthquake which alarmed the inhabitants of Western Europe, before a great eruption of Vesuvius began. A vast cone was thrown up, from which the imprisoned fires burst forth in rivers of molten lava; and round the base of this cone other smaller ones formed themselves which added their efforts to that of the central crater, and wrought more mischief than in any eruption of Vesuvius since that of 1797.

But, enormous as was the quantity of lava which those cones poured forth, it would seem that Vesuvius was still unable to give perfect relief to the imprisoned gases and fluids which had long disturbed the South of Europe. All that Vesuvius could do had been done; the smaller cones had discharged the lava which communicated directly with them, and had then sunk to rest; the great cone alone continued—but with diminished energy—to pour forth masses of burning rock and streams of liquid lava. That the imprisoned subterranean fires had not fully found relief was shown by the occurrence of an earthquake at Bucharest, late on the evening of November 27, which was only a day after the partial cessation of the eruption of Vesuvius. Probably the masses of liquid fire which had been flowing towards Vesuvius had collected beneath the whole of that wide district which underlies Etna, Stromboli, and the Neapolitan vents. Be this as it may, it is certain that but a few hours after the occurrence of the earthquake in Wallachia, Mount Etna began to show signs of activity, and by the evening of November 28, 1868, was in violent eruption.

When we consider these circumstances in connection with the recognised fact that Etna is an outlet of the same volcanic system, we can hardly be surprised that the ineffectual efforts of Vesuvius should have been followed by an eruption of the great Sicilian volcano. We can imagine that the lakes of fire which underlie the Neapolitan vent should have been inundated, so to speak, by the continual inrush of fresh matter, and that thus an overflow should have taken place into the vast caverns beneath the dome of Etna which had been partially cleared when the Sicilian mountain was in eruption in 1865. During a whole year some such process had probably been going on, until at length the forces which had been silently gathering themselves were able to overcome the resistance of the matter which stopped up the outlets of Etna, and the mountain was forced into violent and remarkably sudden action.

Unlike Vesuvius, Etna has always, within historic times, been recognised as an active volcano. Diodorus Siculus speaks of an eruption which took place before the Trojan war, and was so terrible in character as to drive away the Sicani who had peopled a neighbouring district. We learn also from Thucydides that in the sixth year of the Peloponnesian war a lava stream destroyed the suburbs of Catania. This eruption, says the historian, was the third which had taken place since the island had been colonised by the Greeks. Classical readers will scarcely need to be reminded of Pindar's graphic description of the eruption which took place fifty years before the one referred to by Thucydides. Although the poet only alludes to the mountain in passing,

* It is somewhat singular that such an Apology as Justin Martyr's should have been addressed to Hadrian, who had expressed a few years before his belief that the Christians are worshippers of the sun-god Serapis. "Egypt," he says in a letter to Servianus, A.D. 134, "which you commended to me, my dearest Servianus, I have found to be wholly fickle and inconstant, and continually wafted about by every breath of fame. The worshippers of Serapis (here) are called Christians, and those who are devoted to the god Serapis (I find) call themselves Bishops of Christ." It adds to the interest and oddness of this passage that it was written about four years after the probable date of the Gospel according to Mark, twenty years or so after the probable date of the Gospel according to Luke, and probably about thirty years after the time when the Gospel according to Matthew was written. (The Gospel according to John was certainly not then in existence, for Justin Martyr makes no mention of it in enforcing the very views which are supported by it alone among the Gospels; while Polycarp, A.D. 168, cites the authority of John in direct contradiction of the views expressed in the Gospel said to be "according to John," but really the most intensely anti-Johannine of all the books of the New Testament. For the fourth Gospel is in the main Pauline, and one has but to turn to the veritably Johannine Apocalypse to find how intensely anti-Pauline John was.)

he has yet succeeded in presenting with a few skilful strokes the solemn grandeur of ancient Etna, the scene of the struggles of the buried giant Typhœus. He portrays the snowy mountain as "the pillar of the heavens, the nurse of eternal snows, hiding within deep caverns the fountains of unapproachable fire: by day a column of eddying smoke, by night a bright and ruddy flame, while masses of burning rock roll ever with loud uproar into the sea."

The cone of Etna rises to more than twice the height of Mount Vesuvius. Of old, indeed, the Sicilians assigned to their mountain a height not falling very far short of that of the grandest of the Alpine mountains. But in 1815, Captain (the late Admiral) Smyth ascertained by a careful series of trigonometrical observations that the true height of the mountain is 10,874 feet. The Catanians were indignant that a young, and at that time undistinguished, Englishman should have ventured to deprive their mountain of nearly 2,000 feet of the height which had been assigned to it by their own observer Recupero, and they refused to accept the new measurement. Nine years later, however, Sir John Herschel from barometrical observations estimated the mountain's height at 10,872½ feet. The close agreement between the two results was spoken of by Herschel—Lyell tells us—as a "happy accident;" but, as Dr. Wollaston remarked, "it was one of those accidents which would not have happened to two fools."

The figure of Etna is a somewhat flattened cone, which would be very symmetrical were it not that on the eastern side it is broken by a deep valley called the Val del Bove, which runs nearly to the summit of the mountain, and descending half-way down its banks is connected with a second and narrower valley, called the Val di Colonna. The cone is divided into three regions called the desert, the woody, and the fertile regions. The first of these is a waste of lava and scoriæ, from the centre of which uprises the great cone. The woody region encircles the desert land to a width of six or seven miles. Over this region oaks, pines, and chestnut trees grow luxuriantly, while here and there are to be seen groves of cork and beech. Surrounding the woody region is a delightful and well-cultivated country lying upon the outskirts of the mountain and forming the fertile region. This part of Etna is well inhabited, and thickly covered with olives, vines, and fruit trees. One of the most singular peculiarities of the mountain is the prevalence over its flanks of a multitude of minor cones, nearly a hundred of which are to be seen in various parts of the woody and fertile regions. Of these Sir Charles Lyell remarks that, "although they appear but trifling irregularities when viewed from a distance as subordinate parts of so imposing and colossal a mountain, they would, nevertheless, be deemed hills of considerable magnitude in almost any other region."

It has been calculated that the circumference of the cone is fully eighty-seven English miles, but that the whole district over which the lava extends has nearly twice that circuit.

Of the earlier eruptions of Mount Etna we have not received very full or satisfactory records. It is related that in 1537 the principal cone, which had been 320 feet high, was swallowed up within the hollow depths of the mountain. And again in 1693, during the course of an earthquake which shook the whole of Sicily and destroyed no fewer than 60,000 persons, the mountain lost a large portion of its height, insomuch that, according to Boccone, it could not be seen from several parts of the Valdemone, whence it had before been clearly visible. Minor cones upon the flanks of the mountain were diminished in height during other outbursts in a different manner. Thus in the great eruption of 1444 Monte Peluso was reduced to two-thirds of its former height by a vast lava stream, which encircled it on every side. Yet, though another current has recently taken the same course, the height of this minor mountain is still three or four hundred feet. There is also, says Sir Charles Lyell, "a cone called Monte Nucilla, near Nicolosi, round the base of which successive currents have flowed, and showers of ashes have fallen, since the time of history, till at last, during an eruption in 1536, the surrounding plain was so raised that the top of the cone alone was left projecting above the general level."

But the first eruption of which we have complete and authentic records is the one which occurred in the year 1669. An earthquake had taken place by which Nicolosi, a town situated about twenty miles from the summit of Etna, was levelled to the ground. Near the site of the destroyed town two gulfs opened soon after, and from these gulfs such enormous quantities of sand and scoriæ were thrown out that a mountain having a double peak was formed in less than four months. But, remarkable as was the evidence thus afforded of the energy of the volcanic action which was at work beneath the flames of the mountain, a yet more striking event presently attracted the attention of the alarmed inhabitants of the neighbouring country. On a sudden, and with a crash which resounded for miles around, a fissure, *twelve miles in length*, opened along the flanks of the disturbed mountain. The fissure extended nearly to the summit of Etna. It was very deep—how deep is unknown—but only six feet in width. Along its whole length there was emitted a most vivid light. Then, after a brief interval, five similar fissures opened one after another, emitting enormous volumes of smoke, and giving vent to bellowing sounds which could be heard at a distance of more than forty miles.

At length the eruption commenced in earnest. The volume of lava which was poured forth was greater than any that has ever been known to flow from the mountain during historical times. According to the estimate of Ferrara, no less than 140 millions of cubic yards of lava were poured down the sides of the mountain. The current, after melting down the foundations of a hill called Mompiliere, overflowed no fewer than fourteen towns and villages, some of which had as many as three thousand and four thousand inhabitants. Alarmed at the progress of the sea of lava which threatened to overwhelm their city, the Catanians upreared a rampart of enormous strength and sixty feet in height. So stoutly was this bulwark established that the lava was unable to break it or to burn it down. The molten sea gradually accumulated, until at length it rose above the summit of the rampart, from which it poured in a fiery cascade, and destroyed the nearer part of the city. "The wall was not thrown down, however," says Sir Charles Lyell, "but was discovered long afterwards by excavations made in the rock by the Prince of Biscari, so that the traveller may now see the solid lava curling over the top of the rampart as if still in the very act of falling. The current had performed a course of fifteen miles before it entered the sea, where it was still 600 yards broad and 40 feet deep. It covered some territories in the environs of Catania, which had never before been visited by the lavas of Etna. While moving on, its surface was in general a mass of solid rock, and its mode of advancing, as is usual with lava streams, was by the occasional fissuring of the solid walls. A gentleman of Catania, named Pappalardo, desiring to secure the city from the approach of the threatening torrent, went out with a party of fifty men whom he had dressed in skins to protect them from the heat, and armed with iron crows and hooks. They broke open one of the solid walls which flanked the current near Belpasso, and immediately forth issued a rivulet of melted matter which took the direction of Paterno; but the inhabitants of that town, being alarmed

for their safety, took up arms and put a stop to further operations."

In the eruption of 1755 a singular circumstance occurred. From the Val del Bove, usually dry and arid, there flowed a tremendous volume of water forming a stream two miles broad, and in some places 34 feet deep. It flowed in the first part of its course at the rate of two miles in three minutes. It is said to have been salt, and many supposed it had been in some way drawn from the sea, since its volume exceeded that of all the snow on the mountain. It has, however, since been found that vast reservoirs of snow and ice are accumulated in different parts of the mountain beneath the lava. The snow was melted by the heat of the rising lava, and was made salt by vaporous exhalations.

Of the singular solidity of the walls of an advancing lava stream, Recupero has related a remarkable instance. During the eruption of 1766, he and his guide had ascended one of those minor cones which lie, as we have said, on the flanks of the mountain, and from the summit of this hill they watched with feelings of awe the slow advance of a fiery river two miles and a half in breadth. Suddenly they saw a fissure opening in the solid walls which encircled the front of the current of lava; and then from out this fissure two streams of lava leaped forth and ran rapidly towards the hill on which the observers were standing. They had just time to make their escape, when, turning round, they saw the hill surrounded by the burning lava. Fifteen minutes later the foundations of the hill had been melted down, and the whole mass floated away upon the lava, with which it presently became completely incorporated.

It would be a mistake, however, to suppose that such an occurrence as the one we have just related is often observed. On the contrary, it seems that when burning lava comes into contact with rocky matter, the latter is usually very little affected. It is only when fresh portions of incandescent lava are successively brought into contact with fusible rocks that these can be completely melted. Sir Charles Lyell quotes a remarkable story in illustration of the small effects which are produced by lava when there is not a continual supply of fresh material in an incandescent state. "On the site of Mompiliere, one of the towns overflowed in the great eruption of 1669, an excavation was made in 1704; and by immense labour the workmen reached, at the depth of 35 feet, the gate of the principal church, where there were three statues held in high veneration. One of these, together with a bell, some money, and other articles, was extracted in a good state of preservation from beneath a great arch formed by the lava." This will seem the more extraordinary when it is remembered that eight years after the eruption the lava was still so hot at Catania, that it was impossible to hold the hand in some of the fissures.

Among the most remarkable of the eruptions of Etna which have taken place in recent times are those of 1811 and 1819.

In 1811, according to Gemmelaro, the great crater gave vent, at first, to a series of tremendous detonations, from which it was judged that the dome of the mountain had become completely filled with molten lava, which was seeking to escape. At length a violent shock was experienced, and from what followed it would seem that by this shock the whole internal framework of the mountain had been rent open. For, first, a stream of lava began to pour out from a gap in the cone not far from the summit. Then another stream burst out at an opening directly under the first, and at some distance from it. Then a third opening appeared, still lower down; then a fourth, and so on, until no less than seven openings had been formed in succession, all lying in the same vertical plane. From the way in which these openings appeared, and the peculiarity that each stream of lava had ceased to flow before the next lower one burst forth, it is supposed that the internal framework of the mountain had been rent open gradually, from the summit downwards, so as to suffer the internal column of lava to subside to a lower and lower level, by escaping through the successive vents. This, at least, is the opinion which Scrope has expressed on the subject in his treatise on "Volcanoes."

(*To be continued.*)

SEA SERPENTS AND DRAGONS.*

IT would be difficult to say which of the two great classes of the unthinking do most mischief—those who believe everything, or those who believe nothing. Unfortunately both classes are very numerous, and far outnumber those who believe only what they have reasoned about, and have either learned themselves or received after due consideration from those whom they recognise as competent to express an opinion.

To the foolish who believe everything we owe the wide prevalence of superstitions, from those of the most childish nature, to those which seem to have an air of respectability but in reality are only very ancient mistakes. To the foolish who believe nothing we owe in like degree the prevalence of superstitions, many of them very stupid. If one set oppose all discovery, all results of original thought, because inconsistent with their beloved superstitions, the other equally oppose all new truths because inconsistent with their narrow range of ideas. And although one might imagine the opinion of neither set to be of any importance, unfortunately men are apt in such matters to count heads rather than to weigh brains; and it is certain that the number of those whose opinion has been of no weight has enormously exceeded in all ages that of those who can render a reason and are therefore worth listening to.

This might matter little if only matters of scientific interest were in question, but matters of political and religious importance are dealt with in the same foolish way. The many who believe every absurd superstition, and the many who believe nothing—the fatuously credulous and the rampantly infidel—have done equal mischief to the cause of true religion; and the name of either class is legion, as revivals and religious disputes alike testify. The many who retain all the mistakes of past ages in matters political, and the many who have no faith in any form of government—the imbecile "subject" and the foolish anarchist—have done equal mischief to the cause of true political progress, and of these also the name is unfortunately "legion," as the last general election (wherever and whenever it took place) abundantly shows.

We may fairly take the conduct of men in some matter of scientific inquiry as typical of their conduct in those more important matters—politics and religion. The book before us presents an interesting set of specimens, (1) of readiness to believe *everything* about floods, dragons, sea-serpents, unicorns, and so forth, and (2) of the equally stupid incredulity which has caused as many foolish persons of another class to raise loud hee-haws when anything has been described which was a little outside the familiar, and to believe in *nothing* new to them.

Mr. Gould's introduction presents admirably the general argument in regard to credulity and incredulity. He perhaps dwells a little too much on the tendency to ignorant

* "Mythical Monsters." By Arthur Gould. London: W. H. Allen & Co.

incredulity, for ignorant credulity deserves quite as much to be censured. But then it must be admitted that, whereas ignorant credulity has already been widely and deeply censured, ignorant incredulity has hitherto in great degree (certainly in undue degree) escaped. Still, throughout the book before us the want of balance can be noticed. It even affects Mr. Gould's own judgment, insomuch that he greatly impairs the weight of the general evidence he brings to bear on each class of wonders he deals with, by accepting almost unquestioningly a quantity of evidence as to detail which is, to say the least, open to grave suspicion.

A very interesting section of the introductory matter is that relating to cuttlefish—which our author very properly takes as an example of a creature which has at last been shown to be, and to do, what the foolishly incredulous had laughed at as out of all reason. The accompanying picture from Mr. Gould's book presents a view painted early in the present century by the celebrated Japanese artist, Hokusai, of a fisherman attacked by a monstrous cuttlefish, even as the hero of "Les Travailleurs de la Mer" was attacked,—only the fisherman seems to be able to oppose no effective resistance. The late Frank Buckland gives an interesting account of a Japanese carving in ivory, said to be one hundred and fifty years old, representing a similar event.

Fig. 1.—Fisherman attacked by Octopus.

It shows "a lady in a quasi-leaning attitude; and at first sight it is difficult to conceive what she is doing, but after a while the details come out magnificently. The unfortunate lady has been seized by an octopus while bathing, for the lady wears a bathing-dress. One extended arm of the octopus is in the act of coiling round the lady's neck, and she is endeavouring to pull it off with her right hand; another arm of the monster is entwined round the left wrist, while the hand is fiercely tearing at the mouth of the brute. The other arms of the octopus are twined round, grasping the lady's body and waist—in fact, her position reminds one very much of Laocoon in the celebrated statue of the snakes seizing him and his two sons. The sucking discs of the octopus are carved exactly as they are in nature, and the colour of the body of the monster, together with the formidable aspect of the eyes, are wonderfully represented. The face of this Japanese lady is most admirably done; it expresses the utmost terror and alarm, and possibly may be a portrait."

The cuttlefish is an excellent example of the slow progress of discovery when obstructed by incredulity of the crassly stupid sort. Because ignorant newspaper writers loaded with abuse every fresh piece of evidence showing the enormous size these creatures attain, and that some could destroy an animal much larger and stronger than man, those who had such evidence preferred not to give it. Only the lucky accident that one or two large cuttlefish were fortunately stranded where there happened to be an intelligent observer or two, while two very large cuttlefish were killed, caused the stories which had been so often and so persistently ridiculed to be recognised as simply accounts of facts. The giraffe, the hippopotamus, the gorilla, and a number of other animals whose existence had been unsuspected or forgotten, gave similar exercise to the cachinnatory powers of the scribblers who represent the foolishly incredulous.

The evidence deduced by Mr. Gould from the extinction of species associated with the evidence based on the continued existence of species—the catfish, for example, still found in the Missouri is a survival of the Silurian era—deserves to be most carefully studied. The recognition of the antiquity of man is also most important in this connection, showing that though, if man had lasted but a few thousand years, we could hardly understand myths of such creatures as the great saurians and bats of long past ages, such memories become very easily intelligible when we find that man has existed many tens of thousands—perhaps many hundreds of thousands—of years upon the earth.

With Mr. Gould's discussion of deluge myths we are not satisfied. It appears to us that all the circumstances in which such myths agree and those in which they disagree are alike explained by a much simpler theory. All races who built large structures, or excavated the earth to any considerable depth, must have recognised the signs of the past presence of the ocean where, in their own time, there was dry land. The Assyrians and Babylonians, the Egyptians, the Persians, and the Indians—all the civilised races of antiquity had eyes to see, and minds wherewith to consider, the evidence which geologists have found convincing in regard to the interchange of land and water. On the sandy plains around the pyramids are found the remains of a tertiary ocean, sea-shells as perfect as those which are rolled upon the shores of our existing seas. In the excavations made by the Assyrians and Babylonians similar evidence came to light. The Indians, Persians, Chinese, Mexicans,—all such nations had evidence of the kind. How could they fail to infer that the seas had once stood where they saw the remains of creatures which only exist in the sea? And uniting this evidence with that derived from partial floods, such as occur in nearly all countries, or in Egypt with the study of the varying overflow of the Nile, what opinion could they form but that, in some remote past age, there had been a great flood destroying all their country? In them that idea would be the idea of a universal flood,

destroying all life, except either such life as might be saved in ships, or such life as might by a miracle be restored to the earth after the waters of the flood had passed away. The story of the Flood, in one or other of the forms combined—oddly enough—in Hebrew records (borrowed, beyond a doubt, from both Egypt and Babylonia), is so far from being a surprising matter, that, considering the multitudinous evidence of the past presence of the seas over regions now high above the sea level, it might fairly have been anticipated that some such story would start into existence in every community which passed beyond the savage state. Even some contrivance for boxing the animals in a sufficiently large vessel would seem absolutely necessary to those who saw that waters had once stood even above mountain heights. For, in the first place, they had no means of knowing how changes of level had brought this about without destroying all forms of animal life; while, in the second place, they knew not what an immense number of forms of life from the various classes of elephants, rhinoceroses, hippotamuses, giraffes, &c., down to creatures too minute to set in some gloomy cave within a forest, as a punishment for the misdeeds of men, or perhaps of their inability to believe in the right sort of deity. The idea that one dragon necessarily implied the existence of hundreds and the past existence of hundreds of thousands, would have seemed absurd to men who could believe in whole nations of men as sprung from single pairs, like Abraham and Sarah, Lot, Esau, Ishmael, and their respective spouses.

But to us who not only believe but *know* that life has existed on the earth, in the sea, and in the air during many millions of years, it is much more difficult to reject the old stories of dragons than to accept them. Of course there were exaggerations, as there have been in the case of the elephant, the giraffe, the crocodile, the boa constrictor, the condor, and so forth. But the general truth of dragon stories, rejected only because of an ingrained belief in erroneous ideas as to the origin of life on the earth, must now be admitted as at least more probable by far than the theory that such narratives are wholly false.

Moreover, we find ancient Egyptian, Indian, Greek, and

Fig. 2.—Sea-serpent seen by Hans (afterwards Bishop) Egede in 1734 off the South Coast of Greenland.

have been noticed by them, must have been boxed within that unsavoury compass if their idea had been sound.

But the chief interest of Mr. Gould's book undoubtedly resides in his discussion of the curious evidence relating to dragons and sea-serpents.

As to dragons, it appears to us that the only reason there ever has been for doubting the existence of large winged creatures, or dragons, in former ages, such as now unquestionably no longer exist, is that based on the supposition that all animals made in the beginning, some six thousand years ago, exist at present. This supposition, absurd as it seems now, was once nearly universal. And it was natural enough. How could men attain to the knowledge that there had been life on the earth, in the sea, and in the air millions of years ago, until a long and careful study of the evidence had forced the truth upon them? Viewing matters as all men did in the Middle Ages, and as most men (despite our boasted progress) view matters still, the belief in dragons could only arise as a superstition after the creatures themselves, whatever they may have been, had disappeared. By special creative act a monstrous dragon might be made, and Roman stories about winged serpents destructive to life, supported by Hebrew narratives. The Jews seem to have encountered on their way from Egypt the destructive serpents which are described in many ancient writings as coming out of Arabia. And the fiery serpents of Numbers are probably the same as the creatures referred to by Isaiah as fiery flying serpents. Josephus, indeed, probably describing the same event which in Numbers assumes a miraculous, and therefore necessarily untrue, aspect, distinctly describes the serpents which troubled the Jews as flying ones. "When the ground was difficult to be passed over," he says, "because of the multitude of serpents (which it produces in vast numbers . . . . and such as are worse than others in power and mischief, and an unusual fierceness of sight [aspect], some of which ascend out of the ground unseen, and also fly in the air, and so come upon men at unawares, and do them a mischief), Moses invented a wonderful stratagem to preserve the army safe and without hurt; for he made baskets like unto arks of sedge, and filled them with ibes, and carried them along with them, which animal is the greatest enemy to serpents imaginable, for

XUM

they (the serpents) fly from them when they come near them," &c. &c.

Comparing Japanese and Chinese pictures of dragons, singular though some of them are, with such pictures as fig. 1, where we see a most carefully drawn octopus (a creature which, if it were not known, would be rejected by all the foolish as impossible), we see that in all probability creatures akin at any rate to the Chinese and Japanese dragons, if not actually identical with them, must have existed in past ages.

As to the sea-serpent, it is, of course, only the very foolish, as the penny-a-liners of some of the daily papers, who now scout the idea that the accounts of strange sea-monsters, serpentine at any rate in aspect, have been truthful. Such persons, imagining the world to be full of folk like themselves, ever ready to invent all sorts of lying narratives, raise shouts of idiotic laughter at the stories of such monsters related by seamen and voyagers of good repute for sense and veracity. It may, indeed, be truly said that we owe to such stupid persons even the lying stories which have unquestionably been told about sea-serpents. For so soon as the idea has once been thrown out by the silly that silly untruths have been told about sea-serpents, their kindred, the tellers of silly falsehoods, are sure to be tempted to supply really false stories of sea-serpents, were it for no other purpose than to prove that such falsehoods may be told.

Although some of the stories told by Pontoppidan, the Bishop of Bergen, may have been exaggerated, there is no sufficient reason to reject the general evidence supplied to him by Northern traders in regard to the existence of strange sea-monsters. His "Natural History of Norway" was published in 1755—not in the third or fourth century as many seem to imagine, who discredit all his accounts as the product of credulous ages like those which accepted the stories handed down to us by the early Fathers. He tells us he had the evidence of creditable and experienced fishermen and sailors in Norway, of which there are hundreds who can testify that they have annually seen "sea-serpents. The North traders, he adds, who came to Bergen every year with merchandise thought it a very strange question when they were seriously asked whether there were any such creatures—as ridiculous, in fact, as if the question had been put to them whether there be such fish as eel or conger."

Olaus Magnus describes two kinds of sea-serpent. But he wrote from the accounts of others, as did Aldrovandus and Arndt Bernsen. Hans (afterwards Bishop) Egede, on the contrary, figures and describes a sea-monster which showed itself on his passage (as a missionary) to Greenland. "On July 6, 1734," he says, "when off the south coast of Greenland, a sea-monster appeared to us (fig. 2) whose head when raised was on a level with our main top. Its snout was long and sharp, and it blew water almost like a whale; it had large brown paws; its body was covered with scales; its skin was rough and uneven; in other respects it was as a serpent, and when it dived its tail, which was raised in the air, appeared to be a whole ship's length from its body." The drawing (fig. 2) appears to have been made by another missionary, Mr. Bing, who stated that the creature's eyes seemed red and like burning fire.

Laurance de Ferry, captain in the Norwegian navy, actually wounded one of the Norwegian serpents, and two of his men testified on oath to the truth of his account. Bishop Gunner describes a race of sea-serpents found in the sea of Finmark. Captain (afterwards Sir Arthur) de Capell Brooke collected accounts of a sea-serpent seen several times from July 1849 till the warm weather was over. These are given in full in Mr. Gould's book. A similar animal was seen in 1822, in 1845, and 1848. The Rev. Alf. C. Smith, writing in 1850, summarises thus the result of his investigations: "I cannot withhold my belief in the existence of some huge inhabitant of those Northern seas, when, to my mind, the fact of his existence has been clearly proved by numerous eye-witnesses, many of whom were too intelligent to be deceived, and too honest to be doubted."

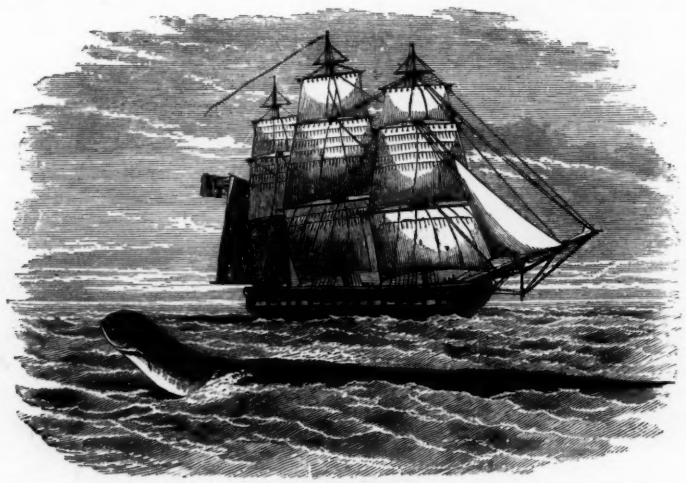


Fig. 3.—Sea-serpent seen by the Officers and Crew of the Government Frigate (or, in the vulgar, Her Majesty's Ship) "Dædalus" in 1848.

We may mention next a sea-serpent seen and described by Mr. MacLean, parish minister of Eigg, in 1809; another seen and described by the Rev. John McRae, of Glenelg, and the Rev. David Twopeny, vicar of Stockbury, Kent; and another seen in 1882 by Mr. Barfoot, J.P., of Leicester, Mr. Marlow, solicitor, of Manchester, Mrs. Marlow, and several others, near the Little Orme's Head.

In American waters the sea-serpent has been seen several times on the coast of Maine—possibly the same creature—during the thirty years preceding 1809. Eleven depositions were taken, the witnesses being persons of unquestioned veracity. In 1819 a similar animal was seen off Nahant. In 1847 five officers of the garrison at Halifax, when on a

fishing excursion, saw a sea-serpent—by which name, here and elsewhere in this article, we mean to imply only a creature corresponding, so far as appearances went, with the animal which has been so called.

The sea-serpent seen by the captain and officers of the Government ship *Dædalus* is shown in fig. 3. There is an account of this creature in one of the volumes of the Knowledge Library Series, either "Rough Ways made Smooth," or "Pleasant Ways in Science," we forget which.* Numbers of other cases in which strange sea-monsters were seen are described in full in Mr. Gould's most interesting volume. It contains nearly a hundred curious illustrations, besides the three which Messrs. W. H. Allen & Co. have been good enough to lend us for this article.

The chapters on the Unicorn and the Phœnix will be found well worth reading.

SOME PUZZLES.

DURING a recent transatlantic voyage, a section of the passengers agreeably passed a portion of the time by proposing puzzles of various sorts, and endeavouring to solve puzzles set by others. Doubtless many of the puzzles thus set were old enough; yet if they were new to those who tried them they gave not less pleasure though they might be ancient to the puzzle-solving world. Many a half-hour which might otherwise have been dreary enough was pleasantly employed in trying to turn each set of letters, ASONUIS, NEW DOOR, and HOATS into one word; the field of three squares, formed by cutting out a quarter from a large square, was divided into four equal and similar divisions, in the manner familiar to most of us, after considerable mental exercise, by those unfamiliar with the problem; and many arithmetical and geometrical puzzles of greater or less interest and difficulty were set and discussed.

It occurred to the writer of these lines that in such exercises we have in reality as useful a mental discipline as our universities in their wisdom give for the training and testing of men who are to be our lawyers, our doctors, and above all our divines. In verse-making, Latin or Greek, for example, we have verbal puzzledom. In problems about triangles, squares, circles, and so forth, we have geometrical puzzledom. In algebra, the differential calculus, and the calculus of variations, we have arithmetical puzzledom. It is all, no doubt, highly beneficial. It at least serves to pass away the *ennui* of three or four years in college. And though perhaps future ages and races hereafter to inherit the earth may somewhat wonder at the system—*as applied* in testing men's fitness for religious, legislative, political, philosophical, and scientific careers—they will have to admit, I suppose, that it had its pleasing aspect.

Further, it appears to us that the study of such puzzles as are set merely for amusement may be made useful in the way of instruction. For instance, when the familiar puzzle is set which relates to the farmer, ignorant of numbers, who left 17 horses to his three sons (or, equally well it may be, an Arab sheik who left 17 camels), half to the eldest, a third to the second, and a ninth to the youngest, the solution sets the inquirer, who also may have been somewhat ignorant of numbers, to the discussion of fractions in a practical way, and may throw more light on this useful department of arithmetic than much study of arithmetical rules from books.

Then a puzzle of this sort lends itself to consideration in the way of extension or amendment. For instance, suppose the same problem set about 35 camels, with the additional requirement that the cadi (whatever a cadi may be) who settles the dispute shall not only satisfy the three sons but take one animal for himself—the sons being as ignorant of numbers as their papa—then we have an amusing as well as an instructive problem. The solution might run somewhat as follows:—

The cadi being appealed to, said, after the manner of cadis, "Because I cannot carry out your father's wishes without making you a present of a camel, I will generously bestow upon you my favourite camel Fatima; let her be added to your father's bequest." Then, standing at the door of the stable, he said to the eldest son, "How many of these 36 camels do you claim as your half?" And the eldest son answered, "I claim 18, thanks to your generosity, oh cadi, in adding Fatima to my father's camels." "Let 18 camels be forthwith given to this youth," said the cadi to his servants; and 18 camels were accordingly led forth and taken away by the intelligent young man. "And you, oh promising second son of an arithmetical father," gravely remarked the generous cadi, "how many do you claim as your third?" And the lad safely replied, "I claim 12." Twelve camels, therefore, were led forth; and the second son departed rejoicing, for that he had received more than his father had bequeathed unto him. "And now, oh my son," said the cadi, standing with his servants around the front door of the stable, "how many camels do you count as your share—one-ninth part—of your father's bequest?" "Nay, oh my lord," replied the boy, scratching his head after the manner of a puzzled Giaour, "I cannot tell how many camels the ninth part of 35 may be; but now that your resplendent generosity has added the beauteous Fatima to the number, making it 36, I find that the ninth part thereof amounts, according to the infidel Cocker, to four; and I beg that I may take away so many." Then the cadi replied, with a beaming smile, "Oh boy, thou hast counted aright; nine times four are assuredly thirty-six. Take, then, thy four camels, according to thy father's bequest." And the boy departed rejoicing, with his four camels, which the cadi's servants led forth from the front door of the stable. Howbeit, when the lad had departed from before the front door, the cadi's servants led forth two camels from the door at the back. And when the three sons met soon after, they found that, strange to say, the much-admired Fatima, which the cadi had generously bestowed upon the family, had not fallen to the lot, either of the eldest, of the second, or of him that was youngest of birth. "Doubtless," said they, "El Shaitan has transformed it into a camel of less noble aspect."

A favourite puzzle, always sure to find some to whom it presents the charms of novelty and difficulty, is the fine old 64-65 fraud, which was probably invented by some commercial traveller from the far East—a bagman of Bagdad so to speak. We suppose all the readers of KNOWLEDGE know this old puzzle. A square, ABCD, fig. 1, like a chess-board, is divided by the lines BE, EF, and GH, into four parts, and a coin, say a sovereign, is put, or supposed to be put, on each square. Then the pieces are arranged as shown in fig. 2, and it is found that the 64 sovereigns will not cover the squares now formed, of which there are 65.

The explanation of the apparent mystery is simple enough.

* We may add here that Capt. McQuhae invited all who had seen the creature, and had any skill in drawing, to depict it to the best of their recollection. They did this without having any chance of comparing their drawings together; and the pictures, when finished, were collected and placed under seal. I have this on the authority of a commander in the Government navy, who informed me also that British officers laugh at Prof. Owen's fond conceit that the sudden alarm caused the officers and crew of a frigate to mistake a rather large sea-elephant for a sea-serpent.

XUM

Yet in any large gathering of persons variously trained mentally, one or two will nearly always be found who are quite unable to interpret the puzzle, and who appear to regard the extra square in the long rectangle as the work of the enemy of mankind. Probably some of those taken in by the Bagdad bagman attributed their loss to Ahriman in veritable earnest.

But simple as this puzzle is, it is very seldom set as it should be; insomuch that as usually set a keen eye will readily detect the imperfect nature of some of the squares. Of course we cannot get all the squares right by any construction, but we can double the chance of deceiving the eye by planning the trick properly. Instead of drawing a square as in fig. 1 and dividing as there shown, as is usually

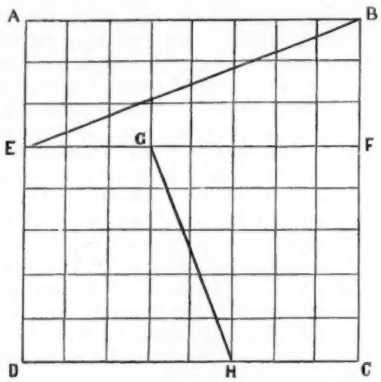


FIG. 1.

done, it is better to proceed as follows:—Draw a rectangle as in fig. 2, and then pencil lightly a straight line from B to *b*; it will be found that this pencilled line passes above *e* and below E (the nearest corners of small squares) cutting *fa* and AF in *h* and *g* respectively. Draw then a straight line from B to a point midway between *h* and E and to a point midway between E and *g*; draw also from *b* a straight line to these same points, and make cuts along these four lines. You thus remove a long parallelogram having B*b* as its longest diagonal. This, however, is only half the long parallelogram really wanting when the pieces of fig. 1 are put into the form of a rectangle having sides with five and thirteen divisions. Thus, when you complete the division by cutting along *ea* and AE, the discrepancy

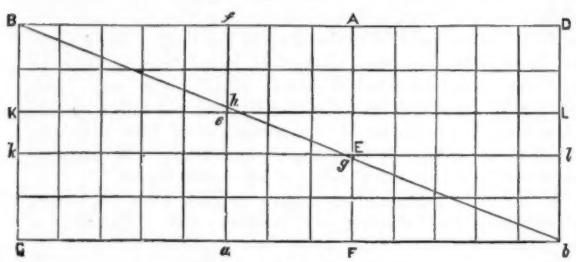


FIG. 2.

which really exists between fig. 1 and fig. 2 is equally distributed between the two arrangements, instead of all falling on one (the arrangement of fig. 2) as usual.

Of course, if the division has to be made in public, one cannot apply this method. But it is far better to have the pieces neatly cut beforehand, as the effect of the puzzle is much enhanced by having the squares all neatly drawn. By the way, the chance of deceiving even the keenest eye may be yet further increased by very slightly curving the lines *fa* KL, so as to bring their point of intersection somewhat nearer than *e* to *b*, and the like with the lines AF and KL.

Three puzzles interested us as leading to further analogies. Oddly enough, they seemed related severally, as the student may find on examining them, to the three conic sections—the ellipse, parabola, and hyperbola. We give them for solution and examination in the next number of KNOWLEDGE, noting that we cannot find space for the names of those among our readers who may solve them, so that it would be wasting postage to send solutions.

1. A farmer has 19 trees, which he wishes to arrange in 9 rows, 5 in each. How should he plant them?

2. A man has a piece of oilcloth 4 yards long by 3 feet broad, and he wishes to divide this into two portions which shall fit a hall 3 yards long by 4 feet broad; how shall he cut his oilcloth?

3. A man marks 6 straight lines on a field in such a way as to enclose 10 spaces. How does he manage this?

MIND ACTING ON BODY.

BY RICHARD A. PROCTOR.

CASES, such as have been hitherto described, throw far less light on the powers which the mind possesses over the body than those in which actual organic change results from the mental act, continued long enough. The following case, in which blindness (of one eye) was certainly not dependent on defective nerve-force, is in this sense particularly interesting. Mrs. S. had had severe rheumatic fever in 1839, during the course of which the left eye was affected, in such sort that both its internal and its external structure suffered injury. In 1842, when Mrs. S. first consulted Mr. Braid, this eye was free from pain, but was useless. More than half the cornea was covered by an opaque film, any object placed opposite the outer or left half of the eye (the temporal half, doctors prefer to call it) being seen through a dense haze; and the objects placed towards the opposite side were seen very imperfectly, owing to the injury which the choroid and retina had sustained in the points on which the images of such objects were reflected. The opacity was not only an obstacle to distinct vision, but was also a source of annoyance from its disfigurement, being obvious even at a considerable distance. "Mrs. S. was a relation," Dr. Todd mentions, "of Mr. Braid, and was in his house three months before he operated upon her, during which time no change took place. Violent pain in the arm and shoulder induced her to submit to the hypnotic treatment, which proved successful; but what was more surprising, and quite unlooked for by Mr. Braid, her *sight* was so much improved that she was able to see everything in the room, and to name different flowers, and distinguish their colours, whilst the right eye was shut, which she had not been able to do for more than three and a half years previously. The operation was continued daily, and in a very short time *the cornea became so transparent that it required close inspection to observe any remains of opacity.* After the first operation there was considerable smarting in the eye, which continued all night, and in a less degree after future operations, which no doubt" (be it remembered, it is not Mr. Braid, but Dr. Todd, who expresses this opinion) "roused the absorbents, and effected the removal of the opacity. Stimulating the optic nerve to greater activity, however, must have been the chief cause of the very rapid improvement which enabled her to see objects after the second operation. Mr. Braid adds to the

foregoing, that objects were seen from the temporal side of the eye much more distinctly than from the nasal side, owing to the irreparable damage the retina and choroid had sustained."

Instances of the cure of deafness must in the great majority of cases be ascribed to the increase in the flow of nervous force along the aural nerves, and, therefore, are not quite so surprising as the case just cited and others of a like nature. Still, some of them have been very remarkable. Take, for instance, Mr. Braid's account of the cure of Nodan, a deaf mute, aged twenty-four, who, according to the opinion of Mr. Vaughan, head master of the Deaf and Dumb Institute where Nodan was a pupil, had never had the power of hearing, properly so called. "After the first operation," says Mr. Braid, "(inducing hypnotism, then extending the limbs and fanning the ears), I satisfied myself he had no sense of hearing; but after the second, which I carried still further, he could hear, and was so annoyed by the noise of the carts and carriages when going home that he could not be induced to call on me again for some time. He has been operated on only a few times, and has been so much improved, that although he lives in a back street he can now hear a band of music coming along the front street, and will go out to meet it. I lately tested him, and found he could hear in his room on the second floor a gentle knock on the bottom stair. His improvement, therefore, has been decided and permanent, and is entirely attributable to hypnotism, as no other means were adopted in his case." In other words, the cure was entirely attributable to that special form of mental activity which is excited, or, at any rate, becomes available, in the case of hypnotised patients.

We have seen how, through the influence of the mind upon the body, the blind have been made to see, the deaf to hear; we may next consider cases in which the lame have been made to walk—nay, even to dance—by no other influence. Among the experiments by which it was shown that wooden tractors are as effective, *if only they are properly painted*, as iron ones, Dr. Alderson mentions the following:—"Robert Wood, aged sixty-seven, on June 4 was operated upon with wooden tractors for a rheumatic affection of the hip, which he had had for eight months. During the application of the tractors, which was continued for about seven minutes, no effects were produced, except a profuse perspiration and a general tremor. On ceasing the application of the tractors, to his inexpressible joy and our satisfaction, the good effects of our labour were now produced and acknowledged; for he voluntarily assured me that he could walk with perfect ease, that he had the entire motion of the joint, and that he was free from pain—to use his own words: 'As to the pain I have now, I do not care if I have it all my life; that will matter nothing. You may take your medicines—I'll have no more of them!' And, prior to his leaving the infirmary, he remarked how very warm those parts were where the tractors had been applied; and then walked from the infirmary to his own house, assuring his companion that he could very well walk to Beverley." In another case no tractors were used, or any other mysterious form of apparatus employed to excite attention. The attraction used was not magnetic or electrical, but an attraction of a very different kind, not as yet considered among medical remedies—except, by the way, in one case which occurs to me at the moment, and will be found fully recorded, prescription and all, in the pages of "Hard Cash," though the remedy is there prescribed to cure an ailment for which it seems in some degree more appropriate. A young lady of sixteen (we are describing a real case, not the case of Julia Dodd) had for many months been suffering from an inversion of the left foot, which was twisted at right angles with the other, and was treated by orthopædic surgeons with an elaborate apparatus of splints. Neither they nor Mr. Skey (though he recognised the nature of the affection) succeeded in curing it. Psychical agents, however, effected a cure in a few minutes. She willed to use her foot like other people, and she did. "She accompanied her family to a ball," says Mr. Skey, in the *Medical Times and Gazette* for October 13, 1866; "her foot, as she entered the ballroom, being not yet restored to its normal position. She was invited to dance, and, under this novel excitement, she stood up, and, to the astonishment of her family, she danced the whole evening, having almost suddenly recovered the healthy muscular action of the limb. She came to me two days afterwards. She walked perfectly well into my room, and paced the room backwards and forwards with great delight. The actions of the limb were thoroughly restored, and all trace of the previous malady had disappeared."

After reading such accounts as these, accounts given by sober-minded medical men, who would naturally be inclined rather to limit unduly than unduly to exaggerate the power which the mind of the patient may possess over the diseased body, it becomes easy to explain the accounts of seemingly miraculous cures which are published from time to time in various religious (and also in some scarcely religious) journals. Amongst such cases may be cited as particularly credible, when once the influence of the imagination is recognised, the so-called miracles performed by Prince Hohenlohe, for he combined with the princely title,* and the imagined efficacy of royal blood, the attributes of the priest, and personal qualities admirably suited to influence the minds of the weaker sort of men. In one case certainly, in which he cured a man of deafness, his princely position can hardly have helped him much, for the man was also a prince of the blood—Louis, ex-King of Bavaria. Louis's letter describing his own cure, and other wonders, is very curious. It is addressed to Count von Sinsheim. "My dear Count," he says, "there are still miracles. The ten last days of the last month, the people of Würzburg might believe themselves in the times of the Apostles. The deaf heard, the blind saw, the lame freely walked, not by the aid of art, but by a few short prayers. . . . On the evening of the 28th, the number of persons cured, of both sexes, and of every age, amounted to more than twenty. These were of all classes of the people, from the humblest to a prince of the blood; who, without any exterior means, recovered, on the 27th, at noon, the hearing which he had lost from his infancy. This cure was effected by a prayer made for him, during some minutes, by a priest, who is scarcely more than twenty-seven years of age—the Prince Hohenlohe. Although I do not hear so well as the majority of the persons who are about me, there is no comparison between my actual state and that which existed before. Besides, I perceive daily that I hear more clearly. . . . My hearing at present is very sensitive. Last Friday, the music of the troop which defiled in the square in front of the palace struck my tympanum so strongly, that for the first time I was obliged to close the window of my cabinet. The inhabitants of Würzburg have 'testified, by the most lively and sincere acclamations, the pleasure which my cure

* Dr. Todd remarks, with sly humour, that Hohenlohe's "name and titles had probably much to do with his influence. They were Alexander Leopold Franz Emmerich, Prince of Hohenlohe-Waldenburg-Schillingsfürst, Archbishop and Grand Provost of Grosswardein, Hungary, and Abbot of St. Michael's at Gaborjan." How should such a name fail! Hohenlohe was born in 1794, in Waldenburg, and educated in several universities. He officiated as priest at Olmütz, Munich, &c. "When twenty-six," Dr. Todd adds, "he met with a peasant who had performed several astonishing cures, and from him caught the enthusiasm which he subsequently manifested in curing the sick. He constantly appealed to their faith in his power."

has given them.'" Many in like manner were cured through their faith in Father Mathew (not in teetotalism, be it understood); and even after his death many who went lame to his tomb left their crutches there. It was not necessary that the patient should be of the worthy father's persuasion in religion. Many staunch Protestants were cured by him, as they supposed; but in reality by processes taking place within their own minds, and initiated by their own lively imaginations. Whether after cure such persons remained as staunchly Protestant as they had been before, I do not know.*

In a similar way may be explained (or rather must be explained, when due account is taken of the weight of evidence) many cases in which maledictions seem to have taken effect, as by a miracle. Paralysis, which has been often cured by faith, has been produced, though less often, by terror. In the *Medical Gazette* for May 23, 1868, there is a report of a singular case which occurred at the Limerick Sessions. Two men had been charged with having assaulted a relative. "The prosecutor summoned his own father as a witness. The mother of the prisoners, exasperated at the prospect of her sons being sent to prison on the evidence of her own relative, gave expression to her feeling in a malediction, praying that when the old man left the witness-box he might be paralysed, and paralysed he was accordingly, and had to be taken to the hospital. Such miraculous illness not yielding readily to ordinary modes of treatment, the old lady has been requested to remove her curse by spitting on the patient, but this she sternly refuses to do, and the man remains in the hospital." Unfortunately, the end of the story was not given. It would have been pleasing to learn that in the long run the old dame relented, and by spitting on the invalid restored him to health, for then the evidence of the influence of imagination would be complete.

Many will recall here the story of "Goody Blake and Harry Gill." Although Wordsworth calls this "a true story," yet most persons probably imagine that, as related by the poet, it is in a large degree a work of fiction. That Wordsworth himself regarded the punishment of the hard farmer as wrought by supernatural means is well known, and comes out clearly on a comparison between his poetic version of the event and the terse prosaic narrative by Dr. Erasmus Darwin in his "Zoönomia." Yet the story was true enough in all essential points as told by Wordsworth. The elder Darwin's account of the case runs simply thus:—"A young farmer in Warwickshire, finding his hedges broken and the sticks carried away, during a frosty season, determined to watch for the thief. He lay many cold hours under a haystack, and at length an old woman, like a witch in a play, approached and began to pull up the hedge; he waited till she had tied up her bottle of sticks, and was carrying them off, that he might convict her of the theft, and then springing from his concealment he seized his prey with violent threats. After some altercation, in which her load was left upon the ground, she kneeled upon the bottle" (*sic*, it is the old-fashioned word for a "bundle") "of sticks, and raising her arms to heaven beneath the bright moon, then at the full, spoke to the farmer, already shivering with cold, '*Heaven grant that thou mayest never know again the blessing to be warm!*' He complained of cold all the next day, and wore an upper coat, and in a few days another, and in a fortnight took to his bed, always saying nothing made him warm; he covered himself with very many blankets, and had a sieve over his face as he lay" (the benefit expected from this arrangement is not altogether obvious); "and from this one insane idea he kept his bed above twenty years, for fear of the cold air, till at length he died." It was unfortunate for him, by the way, that Turkish baths had not been introduced into England in his time! For probably if he had tried the radiating room of a Turkish *hammam* he would have found that even the old woman's curse did not prevent him from knowing what it was to feel warm; and once recognising this, he would have been able, perhaps, to rise above the superstitious fears to which in reality the sensation of cold was due. The commonplace curse of an old woman whom even the least censorious can hardly regard as altogether worthy of absolute veneration, and who had probably exchanged some rather coarse abuse with Gill in the preceding "altercation," is rather amusingly changed by Wordsworth into a solemn appeal to heaven by a much-injured victim (after all, it must be remembered that Gill had not hurt the old woman, and that a farmer has some right to complain when his hedges are broken and the sticks removed):—

Then Goody, who had nothing said,

(having, it should seem, very little to say)—

Her bundle from her lap let fall;
And kneeling on the sticks she prayed
To God, who is the Judge of all;
She prayed, her withered hand uprearing,
While Harry held her by the arm—
"God! that art never out of hearing,
Oh may he nevermore be warm!"
The cold, cold moon above her head,
Thus on her knees did Goody pray;
Young Harry heard what she had said,
And icy cold he turned away.

Probably we may refer the effect of her malediction rather to her appearance—as described by Dr. Darwin, "an old woman like a witch in a play"—than to the solemnity of her prayer. He believed, in his sudden fear, that she was a witch, his imagination attributed to the witch's curse the cold which naturally enough resulted from his long watch on a bitter cold night, and his fears thus seemingly confirmed so influenced his imagination thereafter, that he experienced the constant sensation of cold described by Darwin. That the actual temperature of his body was also affected may well be believed. For it is well known that persons whose minds are affected undergo a loss of temperature. "In *mélancolie avec stupeur*," says Dr. Ertzbischoff, "the temperature is always below the normal amount." But it is certain the actual loss of heat cannot have been even nearly so great as the apparent, for, if it had, Gill would certainly not have lived twenty years.

I could cite many other illustrations of the influence of the mind, whether stimulated by emotion or by expectation, on the body and its functions; but I have already exceeded the space which I had intended to occupy. Let it suffice now to call attention to the extreme importance, both in a physiological and in a psychological aspect, of the recognition of this influence, and the necessity for more careful and systematic study of its nature and limits than has yet been made. It was said sneeringly by Dr. Elliotson, who was a believer in the mesmeric or preternatural interpretation of effects now demonstrated to be due to imagination only, that if Mr. Braid, Dr. Carpenter, and Dr. Holland

* I was told a few months ago by a worthy, simple-hearted Irish priest, that he was sent for on one occasion to administer the sacrament of extreme unction to a Protestant lady, who (not knowing that Catholicity was an essential preliminary) hoped to find in the sacrament a cure for an attack of inflammation of the bowels, which the doctors had in vain attempted to assuage. They hourly expected her death. Finding no other course open to her, she "made submission," was received into the Church, and the sacrament of extreme unction was administered. When next the family doctor called the lady was well, save for the state of weakness to which many hours of extreme pain had reduced her.

could ascribe the actual extirpation of certain bodily matter to dominant ideas, suggestion, and expectant attention, they "ought to petition for the introduction of these into the next 'Pharmacopœia' of the Royal College of Physicians." "We do make this petition; or at least," says Dr. Tuke with excellent judgment, "let these psychical agents be included in the *armamenta medica* of every medical man." But not alone with reference to the cure of disease have these experiences interest and value. Rightly apprehended, even now when they are incomplete, they throw much light on the qualities and functions of the brain. But if the study of such cases were carefully and sedulously pursued, observations and experiments being multiplied, as they well might be, I believe that some of the most difficult problems of mental physiology would before long be interpreted, and that mental powers as yet unsuspected would before long be revealed.

CLOTHES MOTHS.

By E. A. Butler.

IN previous papers we have studied the household representatives of the first two orders of insects, the Coleoptera and Hymenoptera; we may now pass to the third, viz., the Lepidoptera, or butterflies and moths. The insignificant but abominable pests referred to in the heading of this paper will be at once recognised as very familiar examples of this order. The term clothes moth, however, like most popular names, is a vague and indefinite one, and in most cases it is not easy to say what insect really is meant when the term is used. Any small moth found indoors usually gets branded with this opprobrious epithet, which is thus applied indiscriminately to several species, to some justifiably, to others the reverse. There are at least half a dozen kinds of small moths that regularly and more or less commonly take up their abode with us, but while some of them are indeed fearfully destructive to woollen and other animal stuffs, others are either general feeders or depend for their sustenance upon various vegetable substances, and, as a rule, probably do no harm to our clothes at all, and it will be our business here to endeavour to discriminate carefully between these different insects.

The term "moth" itself even is but a vague one, for it is the only popular designation for a great variety of insects differing considerably in structure and habits; and to get a clear and accurate notion of those that inhabit our houses, and of their relations to one another and to the other members of the group, it will be necessary first to say a few words about the order Lepidoptera in general.

It will be remembered that the word Lepidoptera means "scale-wings," the scales being that mealy powder which constitutes the colouration and pattern of the wings above and below, and which in one form or other is found in all species of the order, and may be regarded as characteristic. Now in the first place this large order may, for convenience sake, be roughly, though not very scientifically, divided into two great groups, which are known as the Macro-Lepidoptera and the Micro-Lepidoptera, i.e., the "great" and "small" Lepidoptera. For brevity's sake these long names are usually curtailed to Macros and Micros respectively. In the former group are included the butterflies, and the majority of the more conspicuous and familiar of the insects called moths—all those insects, in fact, which are sought after so eagerly by the majority of "butterfly-catchers." Most of them are of tolerably imposing proportions. The latter group, on the other hand, few people, except those who specially study them, know or care anything about, the reason for this neglect being merely the small size of the majority; to be small is often to be despised, and so the Micros get scant attention, even from professed collectors. Yet it is to these despised Micros that our household moths belong, so that, economically at least, some of them are of considerable importance, and ought to be of corresponding interest.

A few of the Macros often choose our houses to hibernate in, but the members of this group do not as a rule court our society; the chief inducements for them to enter our dwellings are an open window and a brightly shining lamp within, and then in suitable localities they will enter in great numbers, and sacrifice themselves on the funeral pyre. But these are, of course, but chance visitors, and none of the Macros can be regarded as permanent residents with us, propagating themselves as the Micros do, generation after generation, without ever visiting the outer world.

The Micro-Lepidoptera are subdivided into some five or six very distinct groups, to two only of which, however, our strictly household species belong; these two are called the Pyrales and the Tineæ. The former of these, which are placed at the head of the Micros, are amongst the largest of that group, most of them, indeed, being (notwithstanding the names) larger than the smallest of the Macros, and they can usually be readily recognised by their rather pointed wings and their long slender bodies and legs; it is to this group that, in the articles on the "Entomology of a Pond," published some months ago in this magazine, we referred those beautiful little water-moths, the China-marks, and to it we must now refer the household species known as the Meal Moths, and the Tabby, or Grease Moth. The Tineæ, which may be regarded as some of the lowest of the order, are a very large group of exceedingly varied and interesting habits, and remarkable as containing the smallest of all Lepidoptera; they usually have long, narrow wings, edged with deep fringes, and to them belong the true clothes moths, together with several other insects that make themselves obnoxious to the careful housekeeper in other ways than by attacking furs and woollen garments.

The Tineæ, as containing the more familiar insects, may profitably first occupy our attention. This section numbers about 700 British species, and our household pests belong to several genera scattered throughout this host. The clothes moths, however, are all members of one genus, *Tinea*, which contains about thirty British species, of which only a very few trouble us indoors; the rest feed upon lichens, bark, &c., and are therefore found in the open country. The word Tinea is the Latin name for the caterpillar of a clothes moth; in other words, the Romans applied this name to any grub-like insect that damaged clothes, &c., whatever, according to our modern notions, the species might be. Pliny speaks of "a certain Tinea, which is capable of hanging by a thread, or is clad in a jacket, gradually forming for itself its own garment, like a snail its shell, and when this is taken from it it immediately dies; but when its garment has reached the proper dimensions, it changes into a chrysalis, from which, at the proper time, a little moth issues." It was natural, therefore, that this term should be adopted by modern naturalists as the generic name for the insects that possess the above-mentioned habits; and it is from this genus *Tinea* that the whole section derives the name Tineæ, or Tineina, though it is far from being implied by this that the whole group are the foes of textile fabrics. The word, therefore, has nothing to do with our English word "tiny," though it so happens that members of this group are the tiniest of the whole order.

At least four species of the genus *Tinea* are included

under the general name clothes moth, i.e., as attacking some kind or other of animal fabric. They are *T. pellionella*, *biselliella*, *tapetzella*, and *rusticella*. As the habits of these are somewhat different, it will be necessary to treat of the species separately.

And first as to *T. pellionella*. This is a little creature about half an inch in expanse of wings. Its fore wings are of a shining greyish yellow colour, with three indistinct brownish spots in the middle, and the hind wings are whitish grey. It is an abundant species in houses, and may be found at any time between January and October, though most abundantly in the early summer months. Of course the moth itself is innocent enough; it is in the larval state that it does all the damage to clothes, furs, feathers, &c. The larva is a tiny caterpillar, dull whitish, with a reddish brown head. It is remarkable as being the only one of our four clothes moths that makes a tunic or moveable case for itself, protected by which it roams in search of congenial food over our stores of unused and undisturbed garments. Muffs, tippets, and other fur garments it particularly delights in, and many are the valuable furs it has altogether ruined, not so much by the actual quantity of hair devoured, as by the amount it has snipped off and wasted.

The case is most ingeniously constructed; it is made of two materials: an outer layer of fragments of the fabrics that have formed the little creature's food, and an inner layer of silk, which forms a beautifully soft and smooth lining, and is secreted by the caterpillar itself in a manner similar to that in which the silkworm forms its well-known cocoons. It is nearly cylindrical in form, but of slightly larger diameter across the middle, and a little flattened above, and is open at both ends; when crawling or feeding, the little inhabitant thrusts out of one end its head and the three segments of the body behind it, these being the ones that carry the three pairs of legs by which locomotion is effected. As it proceeds on its way it keeps this anterior part of the body exserted, and holding on to the silken lining of its case by its claspers, which are situated towards the other end of the body, drags its house along with it. If danger menaces, it retires completely into its case. The cases are of course very varied in appearance; from the method of their construction it is manifest that their colour will depend upon that of the material upon which the insect has been feeding, and by judicious variations of its dietary the little tailor can be induced to form cases of all conceivable tints, or mixtures of such.

The method employed for adapting the case to the needs of the growing caterpillar is truly marvellous. It is obvious that two kinds of enlargement will be necessary; with the growing stature of the larva the case will need elongation, but it will require an increase in circumference as well; and though the meeting of the former demand presents no difficulty nor necessitates the exercise of much sagacity in the device of a method, the latter might well be the subject of considerable perplexity, and one is scarcely prepared for the extreme ingenuity manifested by the little creature in meeting the difficulty. When it finds its quarters becoming too strait it slits up the case on one side for half its length by means of its scissor-like jaws, and fills up a certain space between the severed edges with the same materials as compose the rest of the case. This done, a similar slit is made, say, at the other end, and the like process gone through again. Though the circumference is now increased throughout, this is not the end of the operation, for the new pieces having been let in only on one side the case thereby becomes a little unsymmetrical; therefore to restore the symmetry of its form two precisely similar operations are carried out on the other side, so that to complete the process no less than four slits have to be made—two at each end—and to be successively filled up with the usual materials. It would appear, however, from the observations of Réaumur, that the insect does not always observe the same order in making these slits, but may vary the order indefinitely.

To lengthen the case all that is necessary is to add successive rings of silk and woollen fibres to the ends, but even in this simple operation there is a choice of methods, for the addition might be made at one end only or at both; the latter device is the one adopted. First of all a ring of new material is added at one end, to effect which the grub does not need to leave its tunic, the whole operation being able to be performed from the inside; a layer of silk is spun out in the form of a continuous thread, and then a number of tiny fillets of the woollen fabric, or fur, are attached to its outer surface by other silken threads. This done, the caterpillar, still without quitting its shelter, rapidly reverses its position, bringing its head into the position previously occupied by its tail; the extreme flexibility of its body, and the rather wider diameter of the case in the centre, enable it to do this very quickly; then the same addition of a ring of felt is carried out at the tail end, and in this way the case is elongated equally at the two ends, and what was originally the middle always remains such, and therefore the oldest part is always to be found in the centre and the newest at the ends.

When the grub is full fed, it must set its house in order and prepare for the helpless condition which precedes its final metamorphosis. The chrysalis state is assumed inside the case, the caterpillar becoming, by throwing off its last larval skin, a little yellowish brown helpless thing, similar in form to the well-known chrysalis of the larger moths. Now a danger has to be guarded against; the insect has to remain some weeks in this state of inactivity, and if the case with its precious freight were simply left lying on the cloth as usual, any moving of the latter might cause the little bundle to roll off and fall no one knows whither and into one knows not what perils. To guard against such a catastrophe, the caterpillar, when it feels the inward promptings which are prophetic of its approaching change, spins some fine silken threads from the ends of the case, and attaches them at their outer extremity to the cloth on which it has been feeding, thus as it were casting many anchors out of both bow and stern of its little boat; its fate is in this way linked with that of the larger object, and a much greater degree of security is thus ensured. Very frequently, however, it altogether forsakes the cloth, and chooses some retired corner or crevice in which to anchor its little craft. Thus all through the three weeks of waiting for its wings it lies in its case, like a mummy in its sarcophagus.

At length the time arrives for the final change. The chrysalis, by the aid of sundry little spines arranged in transverse rows along its back, one row on each segment, works itself along till it reaches the end of the case, and then the imprisoned moth, bursting its chitinous covering at the head, gradually extricates itself from its cerements, which it leaves half projecting from the now useless sarcophagus. The cast chrysalis case forms a very pretty microscopic object; it is almost transparent, slightly tinged with yellowish brown, and shows distinct cases for the antennæ, which clearly present slight constrictions corresponding to the multitude of joints of which the organ itself was composed. It also very plainly shows the hooks along the back, and those on the terminal segment are seen to be the largest and most powerful. On its first exclusion from the chrysalis, the moth's wings are very small and soft, but after a while they expand until they have reached their normal dimensions, and acquired their normal consistency.

Now the little being is ready for the fulfilment of its mission, the propagation of its species. Its methods of

locomotion are twofold; with its four glossy and beautifully fringed wings it can fly tolerably well; but with its six long-jointed legs, it can also run rapidly, carrying its wings close alongside its body, and vibrating its antennæ with an incessant tremor indicative of the excitement which now thrills through its little frame. It needs no food, and indeed there is probably nothing within reach that could serve it as such; for the gross aliment which delighted it when a grovelling grub, possesses no charms for it in its higher state of existence, and indeed, were its tastes to tend in that direction, it could not gratify them, for, like the rest of its order, it has no jaws wherewith to reduce the tough fibres of cloth, and even the usual flexible maxillæ, the two long coils which form the sucking apparatus of moths for imbibing honey, are present only in a rudimentary condition, as is the case throughout the genus *Tinea*. Its sole business, therefore, is to get mated, lay its eggs and die.

As might be expected, the eggs are extremely minute, and they are carefully deposited by the mother on the cloth, or in crevices and corners close to a supply of food. The young grubs hatched from these soon manifest their tailoring propensities, but they seem, at this early stage, to prefer second-hand garments, or rather shoddy, to an entirely new "rig out." In other words, they attack the old cases of their progenitors, which are sure to be lying about in plenty, and by cutting up these larger garments, manage to make some respectable coverings for their own tiny forms; the filaments of wool and fur which have been submitted to the action of the more powerful jaws of their adult ancestors, are in a more manageable condition for the weaker weapons of the juveniles than would be those of cloth that had never undergone such a preparatory process.

Tinea pellionella is one of the commonest and most destructive of our clothes-moths, and is especially partial to furs and feathers; its attachment to the former is indicated in its name, which is derived from the Latin "pellio," a "furrier." It is sometimes therefore called the fur-moth. Its larva has also been known to feed on cobwebs.

Our other clothes-moths must be left till the next paper.

(To be continued.)

COUNTING UNCONSCIOUSLY.*

By PROFESSOR W. PREYER, of the University of Jena.

AT first sight the superscription, "counting unconsciously," seems to contain a contradiction. For whoever counts from one to one hundred realises at each number that he is counting; yet, in truth, there are so many instances where an educated person counts without realising it that he would feel utterly lost in this world should the faculty be suddenly taken from him.

Three coins being placed on a table, any one will, on being asked, "How many are there?" answer, after but a glance, "three." Even when four or five coins are seen but for a moment the answer as to their number will be correctly given. So quickly is the answer returned that no time can possibly have been taken for counting. Hence it follows that counting unconsciously is really an everyday occurrence. The objection that this is no longer to be termed counting is not valid, for if anyone can positively state that there are lying before him three, or four, or five objects he must be able to distinguish numbers; and it is certainly a fact that one who cannot count can also not answer such questions. Children, in order to distinguish three marbles from four, must first add each marble to the other; in this way many learn to count before knowing the numerals. From this it follows that in order to count a knowledge of the numerals is not a necessity; even untrained deaf mutes, who can neither read nor write, are capable of counting, without figures, merely by the aid of their fingers.

From the action of a child who has learned the meaning of the numerals it furthermore follows that it is only by practice, that is, by oft-repeated counting of actual objects, that surety is gained in the art of counting small numbers unconsciously. An idiot, or whoever does not practise, cannot count three without adding one by one, and will never rise above the lowest plane of mental development.

Now, however, as is well known, no one can tell in a moment how many objects are lying before him, provided the number of these objects is somewhat large—approximates, say, fifty. Some persons can count more rapidly than others: a broker's apprentice will make groups of three, of five, of ten coins, and then add the groups together; the experienced money-broker is able to determine in a few seconds what the amount is, and this, perhaps, without even touching the coins. But he too, as well as everyone else, must count attentively as soon as the number of pieces exceeds a certain limit. But what is this limit?

Dase, the well-known calculator, who died in 1861, stated that he could distinguish some thirty objects of a similar nature in a single moment as easily as other people can recognise three or four, and his claim was often verified by tests. The rapidity with which he would name the number of sheep in a herd, of books in a book-case, of window-panes in a large house, was even more remarkable than the accuracy with which he solved mentally the most difficult problems. Not before or after his time has such perfection been attained; but as everyone possesses this faculty to a small extent, and, as it can be improved by practice, it is not impossible that in future other experts in this line may appear. The only trouble is that so few know how easy it is to practise.

In the first place one can by a few trials readily gain the conviction that, without practice, not everyone can distinguish six and seven objects as easily as three and four.

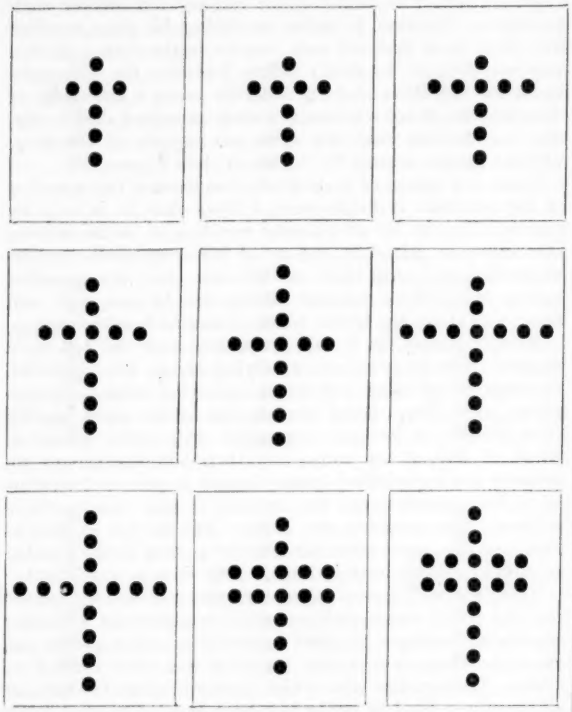
In order to learn that it is a comparatively easy matter to estimate up to six and seven, and then up to nine, as correctly as from three to five, one need only make a few trials in guessing at an unknown number of matches or pins that are concealed beneath a sheet of paper, and are then exposed to view but for a second.

Great care must be exercised, however, that one does not consciously count in these attempts, nor will it answer to attempt analysis from memory after the objects are again hidden from view; all this would consume too much time. It is, in fact, necessary to do nothing more than to *estimate*, but this must be done with the utmost attention.

Whoever has for any length of time tried seriously to guess correctly will be surprised to find that his guesses will soon grow to be generally correct, whereas at the start they were often erroneous. Only when the number of objects seen exceeds nine will mistakes again occur more frequently. However, further practice in estimating greater numbers of small objects will soon cause considerable improvement even here. Many, however, do not succeed in estimating correctly beyond ten, probably because the attention is not sufficiently concentrated at the time, and as it is necessary, at the start at least, that one's whole attention be closely given; only after having attained some

* The experiments suggested here would afford capital amusement as parlour games—having also the advantage of being useful and instructive.

degree of proficiency will the exercise of this power no longer prove fatiguing.



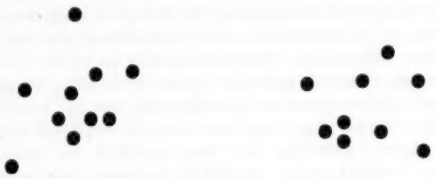
In order to practise this kind of counting, dots and small circles were drawn on white paper squares. Some of these dots were arranged symmetrically, others were irregularly placed. These were glanced at for a moment, and proved of considerable aid in acquiring the art. A good deal depends on the arrangement of the dots. A card-player will immediately, and without stopping to count, realise that there are ten hearts on a ten-spot of that suit, but he will not be able to give as correctly the number of hearts or of dots if these be arranged, for instance, in the form of a cross.

Hence it follows that it is not the symmetry of arrangement that facilitates the estimating, but acquaintance with the manner of arrangement used.

It is more difficult to correctly estimate the number of dots arranged in the form of a cross than to determine them if arranged as on cards and in similar ways.

It is more easy to estimate the dots if arranged as on dominoes; the dots must not be too small, and must be made a deep black on a white ground, or the reverse.

The estimation of the number of dots is most difficult if they are grouped in an irregular manner, as, for instance, in the following figures:—



Practice, which is nought but patient and correct repetition, will, however, even here make perfect. However, it may be regarded as proved by the case of Dase, before referred to, that practice, however long continued, cannot aid beyond a certain limit. It seems that, for the rapid estimation or the unconscious counting of dots placed in unknown symmetrical arrangement, and for objects grouped into irregular forms, twenty is the limit.

Probably already, when the number of the objects exceeds twenty—undoubtedly, when it exceeds thirty—accuracy in estimating can no longer be attained, even after the greatest amount of practice, in which Dase for one certainly was not wanting.

However, this is not to say that more than thirty dots cannot, under any circumstances, be simultaneously determined; but in order that this may be done they must be presented in some well-known manner of arrangement, which must, as it were, have been fairly learned by heart. Thus, very skilful card and domino players are able at a glance to take in as many as forty points, in nines, tens, fives, sixes, &c. This they do so rapidly as not to be conscious of any addition. But in such cases it is no longer the seeing of single dots, but seeing the pictures they form, which makes the feat possible. As no one on seeing the number 8 will count from one to eight, so no card-player will stop to count on seeing an eight of hearts, for instance. A child, however, not yet familiar with the appearance of cards, will count each heart separately, perhaps even touching each one in turn with his finger.

In order to quickly attain the faculty of counting unconsciously, a book may be used to advantage. If one takes a book, opens the same—the eyes to be kept closed in the meantime—and then casts a rapid glance at a part of the page and tries to estimate how many lines are visible, this way of doing, if often repeated and always tried on different pages, will soon conduce to great accuracy in estimating. A small child is not able to estimate even three lines correctly, though looking at them for fully a second.

As the mind develops, it acquires a more simple and rapid process of counting. Something that at first had to be undertaken slowly and with care, perhaps in separate stages, may later on be accomplished much more quickly and without requiring any special effort or calling for any great amount of attention, in fact, almost "mechanically."

One is fully conscious of every perfectly new impression received by the brain; hence the fascination of a novel idea. The more the charm of novelty fades with the recurrence of the same sensation, the less will consciousness be called into play.

An impression that seemed most startling when first received may, if too often repeated, grow to be trivial. The simple work of counting finally comes to be an unconscious action of the nerve-fibres and cells of the brain.

On newly-built roads the trains are run but slowly; the longer such roads have been used the more rapidly are trains run on them, and stops at way-stations are no longer needed; it is even thus with the trains of thought in the human brain.

And on this rests the practical importance of rapid counting. Whoever can, unconsciously but correctly, count up to twenty, or even up to twelve, has a great advantage over others who cannot, without error, distinguish six from seven in this manner. For such a one can turn his consciousness to other matters, and greatly increase his knowledge, where another would make but slow progress.

Those movements in man, which take place through some impression received from without, and not aided by any conscious act of the brain (as, for instance, the contracting of the pupil when a bright light strikes the eye), are termed reflex actions.

In part these are brought about by arbitrary but oft repeated motions, inasmuch as such will gradually take place more rapidly and without premeditation.

In this way, through practice, counting from one to five is done unconsciously, and somewhat resembles a reflex action.

If many such simple mental acts (by the repetition of which nothing new is learned, and time only is lost) could be caused to pass off more rapidly—somewhat resembling reflex actions—the brain would be left free to turn to other, to higher aims.—*Translated for the "Popular Science Monthly" from "Die Gartenlaube."*

THE NATURALIST'S LABORATORY.

Contribution II.

THERE are many items of importance to be attended to in the choice and arrangement of a special apartment for laboratory work that are apt to be overlooked by the majority of ordinary students, so that a few words here upon the subject will not be out of place.

First of all, with regard to light, pure diffused daylight is unquestionably the best, and the window or windows ought therefore to face the north, and command, if practicable, a wide expanse of sky. The room need not be a large one, but, whatever its size, every part ought to admit of being perfectly lighted during the hours of sunlight, so as to allow the most perfect inspection at any time. But, since a clear north light cannot always be commanded, some efficient provision should be made to modify the direct rays of the sun which will then enter through the ordinary panes of window glass, the transparent, colourless material of which may be replaced by translucent ground glass, opal plates, or covered over with a film of white paint or whitewash solution. A ready expedient can be adopted by interposing a screen of white tissue paper or muslin; but these last ought to be removed and frequently cleansed, since they are very apt to harbour dust, and may unexpectedly interfere with the operator's work by an unlooked-for shower at any time. For similar reasons carpets, rugs, and curtains must not be admitted. By following this advice strictly, pure diffused daylight, only slightly inferior to an uninterrupted northern light, will be obtained, and nought can interfere to damage the student's most delicate work.

The window was originally constructed to act as a ventilator in ancient times—it was a *wind-door*; but nowadays the advances that have been made in architecture show that its true function is to *light* the apartment during the daytime, and to act as a ventilator only in a subordinate way. Although professional architects are cognisant of these facts, the greater number of houses in this country are not built under their supervision, and are hence very imperfectly constructed; so much so that the windows are left to perform a principal duty in letting fresh air into the house. It is thus highly probable that many persons may find their chosen *sanctum*, with its north light, subject to violent draughts, with their accompaniments of dust and dirt, aggravated by occasional puffs of smoke from the fireplace during the colder periods of the year. To correct all this would be a great boon to the worker, for it would place it in his power to at once free himself from his worst enemy,—suspended dust,—and to derive much personal comfort during his labours. We shall show in the sequel that the remedy is not only extremely simple, but inexpensive.

The atmosphere of inhabited rooms differs from the normal fresh air both chemically and physically. The products of combustion and respiration attendant upon life and its surroundings—fireplaces, lamps, gas, &c.—tend to vitiate the air and render it eventually quite poisonous. But although the density of the principal pernicious product, carbon dioxide (CO_2=22 when H=1), is greater than that of the principal gases of air—viz. oxygen and nitrogen (O=16, N=14), yet the contaminated air rises to the upper region of the room in virtue of the higher temperature with which it is endowed by its generators, the fire, gas-flame, and the lungs. As soon as it reaches the ceiling provision should be made for its expulsion, otherwise it will have time to cool, descend, permanently pollute the air, and give rise to lassitude, sick headaches, and a general disinclination for work. No doubt this could be remedied by opening the window slightly both at the top and bottom, but such a procedure would not be likely to suggest itself during a cold wintry day, and in warmer weather would admit extraneous dust and dirt. Hence, if no special provision is made for the escape of the foul air, it will descend and make its exit partially through the chimney vent, but not until the conditions of pressure within and out of doors have been so considerably altered that a forced draught is caused through window chinks and beneath the doors of the apartment.

Efficient ventilation thus should provide for the extraction of the vitiated air at a point of vantage, and for the equalisation of pressure (to prevent draughts) by an inlet for fresh air. Appliances without number have been invented from time to time to meet these wants, but in every case attention must be paid to the size and position of the apartment to be ventilated. As a rule, however, it will be found that for a moderate-sized room one outlet for vitiated air will be sufficient, and that should be placed in or near to the ceiling. The form known as "Boyle's Mica-Flap Outlet Ventilator" should be fixed in the breast of the chimney immediately beneath the cornice. The ventilator consists of a metallic box with an open grating in front. Behind the grating are suspended usually four valves of mica, which are practically indestructible, light, and rigid; they are so sensitive that they open with the slightest appreciable up-current in the flue, and immediately close against down-draughts, so as to effectually prevent the smoke from entering the room. As a rule, the up-draught of the chimney is sufficient to extract the foul air through the mica-flap ventilator, but, to make things doubly secure, a chimney cowl should be placed at the top of the flue. The action of the latter is to draw up the air in the chimney, and those constructed upon the passive principle are, without doubt, the best. The slightest gust of wind over the chimney-top induces a vacuum in the head of the cowl, and the foul air is thus effectually sucked up, as it were, and expelled at a part where it cannot do any harm.

A more perfect plan than that just detailed above would involve a well-regulated system of ventilating pipes throughout the house: a special pipe leading from the ceiling of each apartment to an extracting ventilator on the roof, independent of the fireplaces and chimneys. Such a system need not be expensive; indeed, it comes within the easy reach of the poorest class of persons, for there are now firms who make it their business to supply all the requisites for efficient ventilation of houses or of isolated rooms at a very small cost. A case in point is noted in *The Architect* for August 16, 1884 (pp. 100, 101), where the writer says respecting the thorough ventilation of a workman's cottage of about four rooms:—"It may be frankly stated that Messrs. Boyle do not submit this system with any expectation of deriving a profit from the manufacture. It is introduced simply for the benefit of the working and poorer

classes. The following description will suggest the amount of material and labour on one of the ventilators:—One 16-inch diameter 'Boyle's Patent Self-acting Air-Pump Ventilator,' made of galvanised iron and painted; 1½ foot of 8-inch pipe, with dividing plate; 30 feet of 5-inch diameter pipe, 8 feet of 4-inch pipe, two 5-inch junctions, two 5-inch knees, two 5-inch flanges, two 4-inch junctions, two 4-inch knees; four air-inlet brackets, 10 inches by 5 inches by 3 inches. When it is said that all the above will be made of strong galvanised iron, and will cost only four guineas complete, it will be plain that there is no charge for anything beyond the net cost of materials and workmanship. A plan and printed instructions are supplied along with each set of appliances. The system can be applied to tenements at the same rates, every room in the largest block being ventilated separately. *It can also be applied to existing buildings at a trifling extra expense.*

It thus appears that one need not be at a loss nowadays to ventilate a room or a house perfectly and at a small cost. But to return to the subject of admission of fresh air into the room. It should be freed from particles of dust and dirt, should not cause a draught, and should be capable of being warmed or cooled at pleasure. All these desiderata are found combined in many of the inlet ventilators now in the market, such as those of Messrs. Boyle, Lamb, Ellison, and others, and may be adjusted by any ordinary workman with ease. With inlet ventilators one should be careful to select such a position in the apartment as to enable it to work in conjunction with the outlet, and it is in addition advisable to supplement it by adding a closable ventilator to each window, as in Verity's *Multum in parvo* window, where ventilation of the room is assisted by a frame which gives a maximum of light, is burglar and weather proof, and, since it can be turned completely round, may be cleansed from within the room. All these things taken together point it out as the window *par excellence* for the naturalist's laboratory.

Another thing of importance about the structure of the student's room is that the doors should fit so well as to prevent the incursion of dust particles. Now, nearly every door is apt to warp or the threshold to wear away, so that in time a patent space remains beneath through which quantities of dust may enter. This may be prevented by affixing to the base of the door an appliance called "Warhurst's Automatic Dust, Draught, or Rain Excluder." It consists of a movable pad, which rises when the door is opened, and is depressed upon the closure of the latter in such a way as to give perfect contact everywhere with worn, wearing, or uneven thresholds.

Gossip.

By RICHARD A. PROCTOR.

IT has been our wish, since KNOWLEDGE was started in 1881, to give readers more than any other magazine of the same nature has supplied at the same price, and also to make an opening for original interpreters of science on fair, or rather on generous terms. We knew well that competition with the story-telling magazines, which ensure a wide circulation by serial novels or by short narratives, would be useless, so that we could not hope to compare columns with the *Cornhill*, *Longman's*, and similar magazines. Nor, on the other hand, did we expect to provide the same amount of material per shilling as the *English Mechanic*, and other similar magazines intended chiefly to meet the special wants of large classes of working men. But comparing with other journals which have the same general character or scope as this one—the *Popular Science Monthly* in America, *Nature* in England, the *Revue d'Astronomie* in France, &c.—we hoped to be able to give more matter, and especially more original matter. Comparing even with such magazines as the *Contemporary* and the *Nineteenth Century*, we hoped to remain ahead in this respect.

* * *

So far, we have achieved our purpose, and (especially of late) with growing support of an encouraging nature. But it has been at the expense of making every number of KNOWLEDGE more or less of a gift, and by allowing paid contributions to be the only fully paid portion of our work. Every week the editor has had to provide, by work outside KNOWLEDGE, for the extra expenses which a too generous system at starting had involved. After five years on these lines, and finding the time still far off when our growing constituency will pay the expenses of publication, we find it desirable—nay, absolutely necessary—to take in sail, hoping that the favouring breeze of popular support will not cease therefore to waft our bark outwards. We still carry more sail than other craft of the same class. For example, taking those above-named in their order, the comparison will hereafter run thus (taking in each case the supply of matter per sixpence of prices):—

Popular Science Monthly	36 cols., averaging 500 words
Nature . . .	48 cols., averaging 600 words
Revue d'Astronomie .	20 cols., averaging 450 words
XIXth Century & *Contemporary Review*, not illustrated, each .	36 cols., averaging 500 words
KNOWLEDGE, from now .	48 cols., averaging 700 words

* * *

WE trust our readers will recognise the fact that we have done and are still doing the best we can. With regard to the scope and purpose of KNOWLEDGE, we have an object far higher (to our thought) than the mere interpretation or explanation of scientific matters. This object is aimed at specially in such papers as those on the Story of Creation, the Unknowable, and the like. But for the opportunity of suggesting such teachings from nature as are sought to be conveyed in these papers, KNOWLEDGE would not be continued at all. *The great lesson which the recent progress of science teaches is the universal prevalence of law and the consequent futility of lawlessness, no matter under what high or seemingly sacred names it may be disguised.* This lesson we wish KNOWLEDGE consistently and persistently to teach, for of all lessons yet taught mankind this is the most valuable. Other teachings in our pages are but such accessories as have appeared desirable to secure the stability of the Journal from the publishing point of view. Among these must be considered the cheapness at which we formerly aimed. This we have to forego or rather to reduce. The change has, indeed, been too long delayed, and would have been made much earlier had we earlier had such full information respecting expenses and proceeds as we obtain under the present publishing arrangements. If our readers, mistakenly supposing that we are dealing unfairly by them, should desert us, KNOWLEDGE will simply cease to exist. Should they, as we hope, stand by us, KNOWLEDGE will go on without loss (at any rate) to the proprietors. Should they, however, help to increase and extend the circulation of our Journal, as they readily may, we shall hope to return hereafter to our former dimensions. So long, however, as that would involve a monthly loss, it would be folly to continue the attempt.

* * *

Our columns are not, as a rule, open to charitable appeals, but we make an exception in support of a movement to purchase an annuity for Mr. J. B. Dancer, the well-known optician. He was not only one of the first to stimulate microscopy by the manufacture of excellent instruments at a moderate price, but has by his skill and self-denying labour effected important improvements in optical and electrical apparatus; indeed, a long list of inventions stands to his credit, but, unhappily, not a big balance at his bankers, for in his old age he is a poor man, and after giving us eyes to see with, is himself afflicted with almost total blindness. The leading scientists of Manchester are on the committee formed to aid him, and the manager of the Manchester and Salford Bank in that city will thankfully receive subscriptions. We strongly commend the case to the readers of Knowledge.

Reviews.

The Cruise of H.M.S. Bacchante, 1879-1882. Compiled from the Private Journals, Letters, and Note-books of Prince Albert Victor and Prince George of Wales: with Additions by John N. Dalton. Two vols. (Macmillan & Co.)—These stately and sumptuous volumes embody the journals and letters of "Queen Victoria's piccaninnies" (as the West Indian negroes called them), during their three years' travel by land and water, in which the only important exceptions to places visited were India, America, and New Zealand. Mr. Barlow—we beg pardon, we were thinking of "Sandford and Merton"—Mr. Dalton, under whose charge the princes were placed, has made considerable additions to the text, which are indicated by brackets, and but for these it would be extremely difficult to distinguish his work from that of his royal pupils, which at least presumably says something for their literary skill. The sketches of life on board, with its routine and diversions, and of impressions of visits on land under the guidance of experts and the fierce light that beats on princes, have a good deal of freshness about them, and are indeed much above the average of letters sent home by boys to their parents; while the opinions expressed upon Imperial and Colonial subjects give evidence of observation and intelligence which augurs well for the future of young men destined to high functions of State. The section on China, to which Mr. Dalton has added explanatory notes on Confucius and his system, should be read in conjunction with Miss Gordon Cumming's book for its supplemental description of the system of competitive examination; while in that on Japan, where the princes were the guests of the Mikado, we get glimpses into court life. But it is impossible to follow the travellers in detail through 1,500 closely-printed pages, and it must suffice to say that they have, under their tutor's editorial care, given a brightly-written and sensible account of the many lands and peoples visited. Instead of unwieldy maps we have inset charts of the course from port to port, which it was the duty of the princes as midshipmen to prepare, and the routes are thus made easier to trace. But it is discreditable that a book so full of multitudinous matter should be issued without an index.

The Naturalist's Diary: a Day-book of Meteorology, Phenology, and Rural Biology. Arranged and Edited by Charles Roberts, F.R.C.S., &c. (London: Swan Sonnenschein, Le Bas & Lowrey.)—Mr. Roberts, in the novel form of work before us, has rendered a real service to all who may wish to derive that perennial pleasure inseparable from the intelligent observation of rural phenomena. Hundreds of valuable observations are lost through the absence of any well-defined system of making them, and it is to set forth a definite plan for the observer that this very useful Diary has been compiled. It gives the mean temperature, barometer, rainfall, wind, &c., at a selected station, for comparison with those observed in the reader's own locality; furnishes an exhaustive list of British plants and trees, with a practically complete fauna; directs the observer what to look for and when to look for it; and, in fact, supplies all the information necessary to render the various classes of observation of which it treats of real scientific value. Any one who will conscientiously fill in the spaces in this volume devoted to local records, will find by the year's end that he has accumulated a mass of information of real and permanent importance and weight. There used to be a series of works published under such titles as "Every Man his own Butler," &c. Mr. Roberts's volume may be succinctly described as "Every Man his own White of Selborne."

The Mystic Voices of Heaven; or, The Supernatural revealed in the Natural Science of the Heavens. By An Oxford Graduate. (London: Elliot Stock. 1886.)—What Professor Drummond attempted to do, in a more or less scientific spirit, in his "Natural Law in the Spiritual World," the author of the volume of sermons before us essays to accomplish in what, for want of a better word, we may term a rhapsodical one. The "Oxford Graduate" has apparently devoured books on popular astronomy of all shades of authority and value, and has attempted to correlate the statements, well or ill founded, which they contain with the mystical maunderings of patristic literature. The result is a series of discourses in which the enunciation of scientific facts alternates oddly with inflated periods and turgid rhetoric. The entire volume may be regarded as a striking example of misdirected ingenuity. It is a comparatively trivial fault in it that its author quotes mere compilers like Guillemin and Lockyer as of equal weight and authority with such men as Ball, Herschel, Newcomb, and Beckett. *Malgré* this, the student might derive a not inconsiderable amount of astronomical knowledge from our author's pages, into which facts have been emptied wholesale. With regard to the inferences from those facts, however, perhaps the less said the better. It may suffice to remind those disposed to attach any weight to the utterances of "the Fathers" that one of the very earliest of them, Clemens Romanus, derived an argument for the Resurrection from the veracious history of the Phœnix!

Wanderings in China. By C. F. Gordon-Cumming. (Wm. Blackwood & Sons.)—We are not surprised to see this book in a second edition. No work of such abiding value and interest about the Celestials has appeared since Archdeacon Gray's "China," and to Miss Cumming must be awarded the palm for vivacity and picturesqueness of style. Faithful as a photograph, yet without its hardness, since the pages are aglow with the scenes described, is the picture which Miss Cumming presents of this strange land and people, in all the squalor and the splendour, the dignity and dirt, the fantastic and the frightful, which characterise life alike in the cities and the rice-swamps. Miss Cumming has brought together materials in plenty for the archæologist, the sociologist, and the folk-lorist; but perhaps the most striking features of these volumes are the insight into the domestic life of the "lily-footed" upper classes, to which Miss Cumming had the privilege of *entrée*, and the accounts of the State-recognised and universal ancestor-worship, with its resulting terrible burden of custom and expense which the laws of the land and the ingenuity of the priests impose, and with the arrest of material and moral

advance during centuries, for which it is primarily responsible. In all that Miss Cumming has to tell us on this matter, the strength of her observations has its contrast in the weakness of her inferences from them. Now and then we rub our eyes in the feeling that a missionary report has been accidentally stitched-in with the sheets, till we find that we are having the conventional comparisons between the Christian and non-Christian religions which the orthodox mind, with *primâ facie* warrant, but with obtuseness to underlying parallelisms and identities, invariably draws. And then we regret that, through lack of acquaintance with modern theories of the evolution of morals and religion, so genial and sympathetic a writer should be deficient in that sense of relation between the faiths of mankind which gives the key to problems otherwise puzzling and depressing. Mr. Herbert Spencer will find these volumes an armoury of weapons in defence of his theory of ancestor-worship as the base of myth and religion, but the coexistence of nature-worship with it must be set against that, and be allowed its weight in the argument that the base has a wider area than any one theory can cover.

Carlyle and the Open Secret of his Life. By Henry Larkin. (Kegan Paul, Trench, & Co.)—This book may be commended to intending students of Carlyle as a convenient and interpretative introduction, making clear many a dark saying of the man. It consists, in the main, of extracts from Carlyle's writings, and of expansions of the very useful and compact summaries which are appended to many of his works, and for which his readers have to thank Mr. Larkin. Then a few pages are given to Carlyle's relations with Lady Ashburton, and to sundry other causes of friction between the philosopher and Mrs. Carlyle, notably on questions of housekeeping cost, on all which the gossip-hunter may gorge himself in Mr. Froude's biography. But the open secret which is flaunted in the title is told in a couple of lines. It is this: Carlyle wanted to make history as well as write it; to become "one of the seven to eight hundred Parliamentary Talkers with their escort of Able Editors and Public Opinion." But the death of Peel appears to have wrecked any such purpose.

British Fungi. By Rev. John Stevenson, Hon. Sec. Cryptogamic Society of Scotland. (London: William Blackwood & Sons. 1886.) This is the first of two laborious and important volumes classifying the various species of those strange quasi-animal organisms of which the common mushroom is the type. The features, habitats, comparisons between different species in appearance and affinity, together with the spore-measurements, are catalogued in detail, and the author's established position in mycology, or that branch of botany which deals with fungi, combined with that of other authorities to whom his book is indebted, are guarantees as to its accuracy and completeness.

Buckle's Miscellaneous and Posthumous Works. Edited by Grant Allen. (Longmans.)—This is a new and abridged edition of the minor writings of Mr. Buckle which were issued in 1872 under the editorship of Miss Helen Taylor, whose biographical sketch, with its interesting contributions from Buckle's intimate friends, is reprinted. Mr. Grant Allen explains in his brief preface the principle of selection adopted, which wisely excludes the extracts from other authors by which the earlier edition was so unduly swollen. The longest and most important paper is on the reign of Elizabeth, and is largely concerned with the moral and economical state of England during that period. Both it and the numerous fragments, historical and miscellaneous, supply a goodly amount of rough material which students of history may work up with advantage. Buckle was a brave and high-souled pioneer in the investigation into causes determining human progress or stagnation, and if the results of a more complete and more scientifically conducted method have been to show the limitations of his data and their treatment, not the less is the debt of his age to so fearless and laborious a worker to be ungrudgingly recognised.

Ecclesiastical English. By G. Washington Moon. (Hatchards.)—This is Part II. of Mr. Moon's *exposé* of the grammatical and syntactical blunders of the Company of Revisers who have been tinkering with the Authorised Version of the Scriptures. The culprits' names, with their full academic dignities, are all arraigned, and then follows a mass of illustrative evidence in support of the indictment. They are, without doubt, what Wordsworth calls "bad, bold men," and the sentence upon them—Right Reverend Fathers in God and Professors all—is that they do forthwith repair to 16 New Burlington Street, to take private lessons in English on the terms advertised in the prospectus at the end of this book.

A Sea-Painter's Log. By R. C. Leslie. (Chapman & Hall.)—We are glad to renew acquaintance with certain vivid sketches of foreshore life and scenery which appeared in the *St. James's Gazette*, and which are now reprinted with the additional attraction of photographs, reproducing the author's sketches very delicately and softly. Mr. Leslie may take rank with a delightful company of writers—Grant Allen, Richard Jefferies, Phil Robinson, and others—who, leaving the cloud-capped snow-peaks, the majestic and imposing in Nature, skilfully and lovingly describe her quieter and less striking aspects—tidal rivers flowing through long stretches of lowland; mudlands, with their creeks and treacherous ooze, which to the unobserving eye seem tame and monotonous, but which, in the glory of colour they reflect, in the unbroken horizon that shuts out neither sunrise nor sunset, and in their solitude and silence, are rich in material for the artist, be he poet or painter. Mr. Leslie takes us over rough seas in quaint ships, manned by quaint salts of the past, but we like best to ramble with him along the seaboard, or by some decayed harbour with its broken-down quays, its picturesque craft, with here and there a skeleton of timber protruding from the "hard" like the bones of camels in the desert. The long-neglected, obscure towns on our southern and eastern coasts are coming more and more into fashion, and visitors to the old Cinque Ports, or to the rotten boroughs of the Suffolk coast, should take Mr. Leslie's book with them.

A Year in Brazil. By Hastings Charles Dent, C.E. (Kegan Paul, Trench & Co.)—Mr. Dent took advantage of a year's stay in Brazil, whither professional work called him, to collect information concerning the fauna, more especially entomological, of the country. The letters and notes written during his absence have been woven into a record which is unaffected, pleasant to read, and of value as well as interest. But the more important parts of the work, so far as the matters treated of are concerned, are relegated to appendices, the first of which tells us a good deal about the political and social condition of the empire, and the customs and ideas of the native races. Mr. Dent's remarks upon the finances of the country should be noted by the holders of Brazilian bonds, a security which, in our judgment, is too risky for *bonâ fide* investors. The second appendix deals with the natural history, climate, and geology of Brazil, and includes an excursus by the author into matters theological, the gist of which may be predicated from the prominence which he gives to his membership of the Victoria Institute on the title-page, and from the note appended at page 119 for the benefit of the Psychical Research Society. In Mr. Dent's judgment, acceptance of the theory of evolution leads to denial of a personal God who has revealed

Himself to the spiritual nature of man in His word, and to the intellectual nature of man in His works, and, since both revelations must accord, evolution is not true: species are not mutable, man has not risen from an ape-like ancestry, but, as Genesis declares, was created pure and noble, only, being left to himself, went to the bad, from which redemption finally rescues him. The subject is not to be discussed here, but it may be pointed out that the one important flaw in the reasoning is the assumption that a venerable and valuable collection of documents of unsettled origin, of uncertain authorship, and of disputed meaning, is in any sense a revelation. A revelation, which can only be from an omniscient source, must comply with two conditions, namely, make known matters which man cannot find out by himself, and make them known in language absolutely clear and guarded against all possible risk of alteration from transcribers, translators, and printers. The book, which has some pleasing photographs of Brazilian scenery, reproduced by the Meisenbach method, has a copious index—indeed, so copious as to embrace every triviality of the text.

Letters to Dead Authors. By ANDREW LANG. (Longmans.)—Mr. Lang's power of cunning workmanship was never shown with happier effect than in these addresses to the members of the "choir invisible." Some of his critics have taken exception to the imitation of the style of the several authors addressed, but Mr. Lang may retort that "imitation is the sincerest form of flattery." Any way, this is not a book to be analysed or dissected; it is a delicate, graceful piece of writing, to be enjoyed in passivity of soul away from the din of reviewers and the strife of tongues. The letters to Thackeray and Shelley strike us as particularly fine.

Vanity Fair. Two Vols. (Smith, Elder & Co.)—It is a pity that Mr. Lang's letter to Thackeray could not have been prefaced to these initial volumes of a tasty pocket edition, for which the publishers are to be thanked, and which every lover of the great master—the greatest since Fielding—will welcome. How we alike renew our youth, and find echo of the deeper experience of life, as, wearied of the inane or nauseating fiction of the present, we reopen "Vanity Fair," "Esmond," and the rest, and rejoin the familiar company, known as if they had lived in the flesh amongst us.

Still a Wife's Sister. Three Vols. By A. E. SCHLOTEL. (Griffith, Farran, & Co.)—After re-reading "Vanity Fair" who can be in the humour to enjoy a novel which, so far as its purpose may be divined, seems to teach how to dodge the Deceased Wife's Sister Bill? There is no lack of material for an interesting story in these volumes, but the author has let it run to waste over a thousand closely-printed pages, where it is lost in a veritable delta of prolixity, swamping syntax and sense with it. Re-cast and cut down to one-third of the present size, the story might run, and justify a description applied by the author to a novel by her heroine: "Much that would have been dull and heavy was made buoyant by wit and cheerful scenes."

Comrades. By SARAH TYTLER. (Hodder & Stoughton.)—A graceful and wholesome story, with an outside tasty enough to make it a desired school prize.

The Determination of Rock-Forming Minerals. By Dr. EUGENE HUSSAK. Translated by ERASTUS G. SMITH, Ph.D. (New York: John Wiley & Sons; London: Trübner & Co.) The microscopic analysis of rock-sections, which Mr. Sorby was the first to make some thirty years ago, has proved a most important instrument in geological research, throwing light upon internal structures and origins. The present work describes the mechanical methods for preparing and examining rocks suitable for optical study, and also supplies tables of determination of minerals. It is essentially a practical handbook for the lithologist.

Autobiography of Friedrich Froebel. Translated and annotated by EMILIE MICHAELIS and H. KEATLEY MOORE, Mus. Bac. (Swan Sonnenschein & Co.)—The story of the founder and foundation of the Kindergarten system, for which may all childhood, present and to come, made happier by its teaching, and quickened into delight in gain of knowledge through employment of fingers as well as brains, bless Froebel's name. With the foregoing we may couple Miss Hale's *Infant School Management* (Stanford) as an excellent manual of practical application. The authoress has a worthy ideal of the teacher's duty, and of the prime importance of the "tone" to be given throughout the school, reminding one of the influence of Arnold of Rugby over his boys. Said one of them: "I can't tell the doctor a lie: he trusts one so." We like Miss Hale's insistance on the need of discrimination of mental and physical differences. Altogether she has written a good book, both for the home nursery and the school.

A Handy Guide to Norway. By THOMAS B. WILLSON, M.A. (Stanford.)—We can testify, as old travellers in "Gamle Norge," that such a clear and concise guide to that land of stern grandeur and honest folk as the present book designs to be, is wanted. We can recommend it to intending tourists as giving them sufficient information for all practical purposes, and Mr. Stanford has done his usual share of good service in the small maps illustrating the several beaten tracks. For a first visit Route V. should be taken.

Official Catalogue to the Colonial and Indian Exhibition. (Wm. Clowes & Sons.)—*Her Majesty's Colonies: a Series of Original Papers issued under the authority of the Royal Commission.* (Same publishers.)—The Commission is to be thanked for this timely and valuable collection of papers on the origin and history of our several colonies, together with its stores of information about their peoples and productions. The introduction to the work is appropriately written by the author of the "Expansion of England." Prof. Seeley rarely warms to his subject, but he touches the right note when he defines the relation of the colonies to the mother-country as that of limbs whose life depends on a heart and brain outside themselves. For the union between us is not mechanical but vital, and they who would sever it are—well, dividers of men.

The Joyous Story of Toto. By LAURA E. RICHARDS. (Blackie & Son.)—The following report on this book is addressed to us by a competent critic, to whom we delegated our duty:—

"MY DEAR FATHER,—Toto is a very nice book. The plot is that Toto, who is a little boy, lives with his blind grandmother. He was very good to her, and very fond of the wild animals in the woods near his cottage. And since he liked them, they liked him too, and they came to him every day to tell him such pretty tales, so that it makes you think they must be real, and that the animals *did* talk. And it all ends very prettily. EDITH."

English Coins and Tokens, with a chapter on Greek and Roman Coins. By ILLEWELLYNN JEWITT and BARCLAY V. HEAD. *Sea-Weeds, Shells, and Fossils.* By PETER GRAY and B. B. WOODWARD. (Swan Sonnenschein, Le Bas, & Lowrey. 1886.)—In these additions to the "Young Collectors' Library" the respective writers have managed to give in small compass a succinct and clear introduction to each subject, as well as practical instructions in aid of the several tastes to which they appeal. Written by experts, and illustrated with woodcuts far above the average of manuals, the volumes are marvels of cheapness.

XUM

Historic Boys. By E. S. BROOKS. (Blackie & Son. 1886.)—A wholesome book, manly in tone, its character sketches enlivened by brisk dialogue and high-class illustrations; altogether one that should incite boys to further acquaintance with the epochs in which Marcus Aurelius, Baldwin, Leo X., William the Conqueror, and other rulers of men whose careers are narrated, were central figures. We advise schoolmasters to put it on their list of prizes.

We have also received the following:—*Debrett's Peerage and House of Commons* (Dean & Son) for the current year. The Peerage has now reached the venerable age of 173 years, and improves like old wine; therefore needs "no bush" from us; while its fellow volume, packed with information, well set out, embodies changes up to February last.—*Templeton's Practical Mechanic's Workshop Companion* (Crosby Lockwood & Co.), reissued in enlarged form, with such needful revision as the advance of mechanical science demands. The new editor, Mr. Hutton, has done his work carefully and thoroughly.—*Notes on Holman Hunt's Pictures* (William Reeve), indispensable to the visitors to the collection now on view in Bond Street, and, moreover, contains a reprint of matter no longer easily accessible.—*Romance of Mathematics*, by P. HAMPSON, M.A. (Elliot Stock), a clever *jeu d'esprit* on the conquest of conics and cosines by Cupid.—*Sun, Moon, and Stars*, by RICHARD RUSSELL (Ward, Lock, & Co.).—The fourth edition of Mr. Macleod's *Theory and Practice of Banking* (Longmans), of which vigorous and, in some respects, original work we hope to give fuller notice.—Part IV. of *The Rotifera or Wheel Animalcules*, by C. T. HUDSON, LL.D., and P. H. GOSSE, F.R.S. (Longmans).—*Who and What is God?* By Rev. J. LONGLAND (Hamilton, Adams, & Co.).—*St. Luke's Gospel*, Preliminary Examination Scripture Manual, by ARTHUR RICH (Relfe Brothers).—The New York *Electrician*.—The *Woman Question*, by EDWARD and ELEANOR MARX AVELING (Swan Sonnenschein & Co.).—*In the Watches of the Night*: Poems by Mrs. HORACE DOBELL (Remington & Co.)—The *Camera* (Wyman & Son), the first number of a monthly for "those who practice photography," which, both in letterpress and illustrations, makes a good start.

We have received a pile of elementary educational works from Messrs. Griffith, Farran, & Co., Messrs. Cassell & Co., and Messrs. Moffatt & Paige, but none of them call for any special notice here.

THE FACE OF THE SKY FOR AUGUST.

BY F.R.A.S.

THE sun should be watched for the spots which appear from time to time on his disc. Map viii. of "The Stars in their Seasons" exhibits the aspect of the night sky. Minima of the variable star Algol ("The Stars in their Seasons," map xii.) will happen at 12h. 18m. P.M. on the 19th, and at 9h. 7m. P.M. on the 26th, in addition to other times, when their observation will be difficult or impossible. Mercury is an evening star for the first half of the month, and a morning star during the remainder of it. He is in inferior conjunction (or between the sun and the earth) on the 16th. He may be best observed after sunset very early in August, and before sunrise at the very end of it. Venus may be seen glittering over the east north-east part of the horizon before sunrise. Mars now merely looks like a big red star in the western sky, a little to the north of Spica Virginis ("The Stars in their Seasons," map v.). Otherwise the night sky is an entire blank as far as the planets are concerned, Jupiter, Saturn, Uranus, and Neptune all being invisible. The night of the 10th is that on which the familiar August shooting stars may be looked for. They radiate from the constellation Perseus, and leave trails of light in the sky. The moon enters her first quarter at 9h. 6·3m. P.M. on August 6, and is full at 6h. 42·2m. P.M. on the 14th. She enters her last quarter at 7h. 41·8m. P.M. on the 22nd, and is new 5h. 1m. after noon on the 29th. Six stars will be occulted by the moon at convenient hours for the amateur during the month. On August 5, 95 Virginis, a star of the 6th magnitude, will disappear at the moon's dark limb at 9h. 54m. P.M. at an angle from her vertex of 108°. It will not reappear at her bright limb until after it has set. On the 8th, 24 Scorpii, a 5th magnitude star, will disappear at the dark limb at 7h. 15m. P.M. at a vertical angle of 92°. It will reappear at the bright limb at 8h. 34m. at an angle of 255° from the vertex of the moon. On the 11th, *d* Sagittarii, another 5th magnitude star, will disappear at the dark limb of the moon at 6h. 44m. P.M. at an angle of 74° from her vertex. It will reappear at her bright limb at 8 o'clock at an angle from her vertex of 242°. On the 17th, 5 Ceti, a 6th magnitude star, will disappear at her bright limb at 10h. 3m. P.M. at an angle of 10° from her vertex, reappearing at 10h. 32m. at her dark limb at a vertical angle of 323°. On the same night B.A.C. 5, also of the 6th magnitude, will disappear at the bright limb at 10h. 11m. at a vertical angle of 62°, and will reappear at the dark limb at 11h. 21m. P.M. at an angle of 278° from the vertex of the moon. Lastly, on the 19th, ν Piscium, a 4½ magnitude star, will disappear at the bright limb at 10h. 42m. P.M. at an angle of 68° from the moon's vertex. It will reappear at 11h. 47m. P.M. at her dark limb at an angle from her vertex of 261°. The rest of the occultations this month happen during the early morning hours. When our notes begin the moon is in Leo ("The Seasons Pictured," plate xxiv.), which at 5h. A.M. on the 3rd she quits for Virgo ("The Seasons Pictured," plate xxv.). She is travelling across Virgo until 4 A.M. on the 6th, at which hour she crosses into Libra ("The Seasons Pictured," plate xxvi.). Pursuing her course through the last-named constellation, she arrives at 4h. A.M. on the 8th on the boundary of the narrow northern strip of Scorpio. By 11h. 30m. on the same morning she has crossed this and entered Ophiuchus. Here she continues until 7 A.M. on the 10th, when she passes into Sagittarius, her passage through which occupies her until 8h. 30m. in the evening of the 12th. Then she enters Capricornus ("The Stars in their Seasons," plate xxi.). She leaves Capricornus, in turn, for Aquarius at 1 A.M. on the 15th, as she does Aquarius for Pisces at 2 A.M. on the 17th ("The Seasons Pictured," plate xxii.). Her journey through this great constellation is not completed until 9 A.M. on the 20th, when she arrives at the western boundary of the northern prolongation of Cetus, and through this she has passed by 11 o'clock the same night and entered Aries. She is in Aries until 3 A.M. on the 22nd, and then passes into Taurus ("The Seasons Pictured," plate xxiii.). Pursuing her path through the last-named constellation she arrives at 7 P.M. on the 24th on the boundary of the narrow northern strip of Orion. By 7 o'clock the next morning she has crossed this and emerged in Gemini ("The Seasons Pictured," map xxiv.). At 8h. 30m. P.M. on the 26th she leaves Gemini for Cancer. She is in Cancer until 7 A.M. on the 28th, when she crosses the boundary into Leo. Her passage across Leo occupies until 3 P.M. on the 30th, when she quits it for Virgo ("The Seasons Pictured," map xxv.). She is still in Virgo at midnight on the 31st.

Our Whist Column.

BY "FIVE OF CLUBS."

ILLUSTRATIVE GAME.

THE following game illustrates the discard. *Y-Z* save an apparently lost game by following common-sense principles. Had they played according to the recent directive-discard system, *A-B* must have won.

THE HANDS.

B { S (*trumps*).—A, Q, Kn, 9. C.—A, 3. / H.—A, K, Q, Kn. D.—K, 8, 3. }

Y { S (*tps*).—K, 10, 7, 5. / H.—6, 5, 3. / C.—K, 7, 6, 4. / D.—9, 5. }

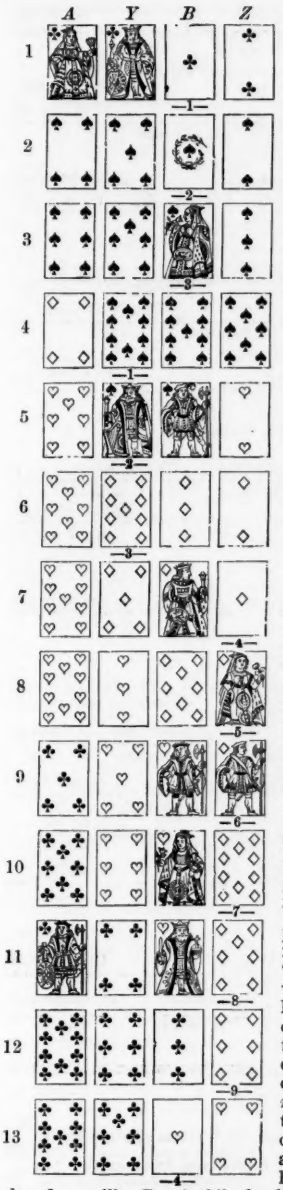
B
A-B. 3

Y Z
*Y-Z.*2 | *Tr.* S. 2

A leads.

{ S (*trumps*).—8, 3, 2. / H.—4, 2. / C.—2. / D.—A, Q, Kr, 10, 7, [6, 2. } *Z*

A { S (*trumps*).—6, 4. C.—Q, Kn, 10, 9, 8, 5. / H.—10, 9, 8, 7. D.—4. }



THE PLAY.

Card underlined takes trick, and card below leads next.

1. *Y* should not have covered. With only three in suit, or with nine instead of seven as his second-best Club, he would have been right in playing the King. (See play second hand in "How to Play Whist.")

2. *B* holds two by honours in his own hand, and therefore "game" unless *Y-Z*, who are at the score of two, can make three by cards. Under these circumstances *B*'s play in leading out trumps is most unwise. If trumps are led at all, the most effective card would have been the nine, though in a plain suit Ace followed by Queen would of course be right.

3. *Y* wisely plays his smallest trump, being sure of two tricks if *B* goes on with the suit. Had he taken the trick, he would have left the major terrace with *B*; as it is, he retains it himself.

4 and 5. *Y* makes his terrace. *A* properly discards from his shortest suit. *Y* is quite right in drawing *B*'s last trump. For there is no other chance of saving the game. *Y-Z* must make every other trick but one, and *Y* has not another trick in his hand. *Z* must not only have a long suit, but must not waste a single card from it. In any case, *Z* would play ill in following to the letter the wooden rule (suited only for wooden-headed players) of discarding from the suit he wants led because the trump lead came from the enemy. Anything more inconsistent with the principles of Whist strategy than this rule, as presented in this general form, it is almost impossible to conceive. "Play the card you can best spare, which will usually be one of your longest suit, when the enemy have command in trumps," is the only form in which the rule for discarding under such circumstances can be given; and here *A-B* have *not* command in trumps, while the *short* suit is that from which cards can best be spared. Had *Y* allowed the Heart discard to direct him to a Heart lead he would have played very ill. But luckily for himself and partner, he saw that the only chance they had was that *Z* might have length and strength in one suit, and sense enough not to discard from it, when probably every card of the suit would be wanted to save the game. Therefore

6. *Y* leads his best Diamond; *Z* finesses (only against one card be it noticed), and

7, 8, 9, &c. *Y* going on with Diamonds, *Z* makes six more tricks, saving and winning the game.

Had the score been "love all" and the game properly played on both sides, it would have resulted as follows:—

First trick taken by *A* (Club Queen); second trick taken by *Z* (ruffing *B*'s Ace), *Y* holding up King; third trick by *Z* (Diamond Ace); fourth trick by *A* (ruffing); fifth trick by *B* (trump Knave, to *A*'s defensive lead of trumps); sixth trick to *B* (trump Ace); seventh, eighth, and ninth tricks to *B* (Heart, King, Queen, Ace); tenth trick to *Y*, trump 10; and then two tricks fall to *A-B* however *Y* may play, one going to *Y*'s trump King. Result:—*A-B* make two by cards and count two by honours.

Again, had the score been "love all," and after five tricks played as in the actual game *Y* had regarded *Z*'s Heart discard as directive, *A-B* would have made five by cards!

Sun-Worship among the Blackfoot Indians.—The chief religious ceremony of the Blackfoot tribes is of foreign origin. This is the famous "Sun-dance," to which they, like the Dakota tribes and some of the Western Crees, are fanatically devoted. That this ceremony is not properly Algonkin is clearly shown by the fact that among the tribes of that stock, with the exception of the Blackfeet and a few of the Western Crees, it is unknown. Neither the Ojibways of the Lakes, nor any of the tribes east of the Mississippi, had in their worship a trace of this extraordinary rite. The late eminent missionary among the Dakotas, the Rev. Stephen R. Riggs (author of the "Dakota Grammar and Dictionary"), says of this ceremony: "The highest form of sacrifice is *self-immolation*. It exists in the Sun-dance, and is what is called 'vision-seeking.' Some, passing a knife under the muscles of the breast and arms, attach cords thereto, which are fastened at the other end to the top of a tall pole, raised for the purpose; and thus they hang suspended only by those cords, without food or drink, for two, three, or four days, gazing upon vacancy, their minds intently fixed upon the object in which they wish to be assisted by the deity, and waiting for a vision from above. Others, making incisions in the back, have attached, by hair ropes, one or more buffalo-heads, so that every time the body moves in the dance, a jerk is given to the buffalo-heads behind. The rite exists at present among the western bands of the Dakotas in the greatest barbarity. After making the cuttings in the arms, breast, or back, wooden setons—sticks about the size of a lead-pencil—are inserted, and the ropes are attached to them. Then, swinging on the ropes, they pull until the setons are pulled out with the flesh and tendons; or, if hung with buffalo-heads, the pulling is done in the dance, by successive jerks, keeping time with the music, while the head and body, in an attitude of supplication, face the sun, and the eye is unflinchingly fixed upon it."

Our Chess Column.

By "Mephisto."

ENGLISH PROBLEM COMPOSERS.

I.—C. Planck.

This composer of problems may, with profit to himself, adopt the motto, "By my work shall ye know me." Mr. Planck has not only done a great deal of work, but he has likewise done it well in every respect. His correctness in composition is excelled by none, while for originality of ideas and neat construction his problems have been famous all over the world. Mr. Planck has composed no less than thirty problems, which have either gained prizes, or have been honourably mentioned. This is, indeed, a fine record, and the best attainable record as far as modern problem composing goes. But we must confess to a feeling of regret, that the old classical ideas of problem composition have been entirely forsaken, at least as far as English composers are concerned. Not but what we admit that the modern canons of construction, purity of position, economy of forces, &c., are correct; but alas! these are considered primarily, and imagination has to take second place, whereas in classical problems imagination predominated without at all unduly straining the total effect of the problem.

By enjoying the following fine examples of Mr. Planck's art, it will be admitted that his compositions are, as a whole, far less open

to reproach in this respect, and are fully deserving of our praise and admiration.

No. 1.—POSITION.

White—K on KB8. Q on QR2. B's on Q4 and QR6. Kt on Q5. P's on K Kt2, 3, Q2, QR3. (Nine pieces.)

Black—K on K5. B on KB6. P's on K Kt4, 5, K3, Q3. (Six pieces.)

Mate in three moves.

No. 2.—POSITION.

White—K on QR3. Q on KR3. Kt's on QKt3, QR5. R on Q5. P's on KR5, Q6. (Seven pieces)

Black—K on K5. R on K Kt7. Kt on QB8. B on Q6. P's on KR4, QB3, QB7. (Seven pieces.)

Mate in three moves.

No. 3.—POSITION.

White—K on QKt sq. Q on Q sq. B's on KB8, QB6. Kt on QKt4. P's on K Kt3, 6, Q2, QKt5, QR2, QR4. (Eleven pieces.)

Black—K on Q5. Kt on QB4. P's on K Kt5, KB3, K3, Q4, 6. (Seven pieces.)

Mate in three moves.

No. 4.—POSITION.

White—K on QR6. Q on KR7. Kt's on QB3, QKt4. B on QR2. P's on KB2, 6, K6, QB4, QR5. (Ten pieces.)

Black—K on Q5, P's on K2, KB6, QR6. (Four pieces.)

Mate in three moves.

No. 5.—POSITION.

White—K on KR8. Q on K sq. B's on Q3, Q8. R on QB5. Kt on K5. P on QKt3. (Seven pieces.)

Black—K on Q5. Q on KR7. B on K Kt8. Kt's on QR5, QR8. P's on KR3, K Kt7, KB5, QKt2, QR3. (Ten pieces.)

Mate in three moves.

No. 6.—POSITION.

White—K on K Kt sq. Q on QB3. B on Q6. Kt's on K3, QB sq. (Five pieces.)

Black—K on K5. B on KB8. Kt on QB sq. P's on KB3, 4, K Kt4, K3, 7, QB3, 5. (Ten pieces.)

Mate in three moves.

No. 7.—POSITION.

White—K on QKt8. B's on KB8, Q sq. Kt's on KB5, Q7. P's on KKt2, 5, QB2, QR5. (Nine pieces.)

Black—K on Q6. P on Q7. (Two pieces.)

Mate in four moves.

No. 8.—POSITION.

White—K on KB8. Q on KB7. B's on Q5, QR7. P's on K Kt4, QKt3. (Six pieces.)

Black—K on K4. B's on KB8, K8. Kt on QB7. P's on KR3, K Kt2, QB6. (Seven pieces.)

Mate in three moves.

No. 9.—POSITION.

White—K on QKt3. Kt's on KB6, Q4. B's on QB3, QB6. P's on KR2, QB2, QR6. (Eight pieces.)

Black—K on QB4. P on QR2. (Two pieces.)

Mate in four moves.

No. 10.—POSITION.

White—K on K Kt8. Q on KB3. R on KB sq. B's on K sq, QB4. Kt on K4. P on QR3. (Seven pieces.)

Black—K on Q5. B on K Kt6. Kt on KR sq. P's on KR3, 5, KKt3, KB7, Q3, 4, QR5. (Ten pieces.)

Mate in three moves.

No. 11.—POSITION.

White—K on K sq. Q on QKt sq. Kt's on KB4, Q5. R on QB6. P's on KR4, K Kt3. (Seven pieces.)

Black—K on K4. P's on KR2, 4, K3, Q3. (Five pieces.)

Mate in three moves.

No. 12.—POSITION.

White—K on K8. Q on KKt sq. B's on K Kt8, Q8. Kt's on Q5, QB5. P's on KR2, KB2, 4, QR3. R on Q sq. (Eleven pieces.)

Black—K on Q5. Kt on Q6. B on QR7. P's on KR6, K Kt3, Q3, QB3, QB6. (Eight pieces.)

Mate in three moves.

SOLUTIONS.

No. 1.—1. Kt to Kt4 / K × B 2. Q to R sq. (ch), &c. If 1. K to B4 2. Q × P (ch), &c., and other variations.

No. 2.—1. Kt to B4 / K × R 2. Q to B3 (ch) / &c. If 1. P × R 2. Q × P (ch) / &c.

If 1. B × Kt 2. Q to B5 (ch), &c., and other variations.

No. 3.—1. B × P / K to K4 2. Q to R sq. / &c. If 1. Kt to K5 2. Kt to B6 (ch) / &c., and several other variations.

No. 4.—1. P to B5 / K × P 2. Kt to R4 (ch) / &c. If 1. K to K4 2. Kt to Q3 (ch) / &c.

If 1. P × P 2. Kt to Kt5 (ch), &c., and others.

No. 5.—1. B to QKt5 / K × R 2. Kt to Q3 (ch) / &c. If 1. P × B 2. Q to Q2 (ch) / &c.

If 1. Q to R4 2. Q × B (ch) / &c. If 1. P to B6 2. Q to Kt4 (ch) / &c. and others (White threatens 2. Kt to B6 (ch)).

No. 6.—1. Kt to Kt4 / K to Q4 2. B to K5 / &c. If 1. P to B5 2. Kt to B2 (ch) / &c.

If 1. P × Kt 2. Q × P (ch) and other variations.

No. 7.—1. P to Kt6 / K to K5 2. B to B2 (ch) / K to Q4 3. Kt to K3 (ch) / &c. If 2. K to B5 3. B to R6 (ch) / &c. If 1. K to B5 2. Kt to Kt6 (ch) / K to Q6 3. B to Q6 / &c.

No. 8.—1. B to R8 / B to Q6 2. B to Kt8 (ch) / &c. If 1. Kt to K6 2. Q × P (ch) / &c.

If 1. P to Kt3 2. Q to QB7 (ch), &c.

No. 9.—1. B to B3 / K to Q3 2. B to QKt4 (ch) / K to K4 3. Kt to Q7 (ch) / &c. If 2. K to B2 3. B to Kt7 / &c. If 1. K to Kt3 2. Kt to K6 / K moves 3. Kt to Q7 / &c.

No. 10.—1. B to Kt4 / P × B 2. Kt to B5, &c. If 1. K × B 2. Q to K2 (ch) / &c.

If 1. K to K4 2. B × P (ch) / &c. If 1. Kt moves, &c. 2. B to Q3 / &c.

No. 11.—1. R to B7 / P to R3 2. Kt × KP, &c. If 1. P × Kt 2. R to K7 (ch) / &c.

If 1. K to Q5 2. R to B4 (ch) / &c.

No. 12.—1. Q × P / K × Kt 2. Q × P (ch) / &c. If 1. BP × Kt 2. Q to K4 (ch) / &c.

If 1. QP × Kt 2. B to B6 (ch) / &c. If 1. B to B5 2. Kt to K6 (ch) / &c.

and other variations.

CONTENTS OF No. 9.

	PAGE
The Unknowable. By Richard A. Proctor	265
The Story of Creation. By Edward Clodd	266
The Well of English Undefiled	269
Coal. By W. Mattieu Williams	270
Galileo, Darwin, and the Pope. By Richard A. Proctor	272
Indian Myths. By "Stella Occidens"	274
Americanisms. By Richard A. Proctor	275
Photography and the Printing Press	276
Mind Acting on Body. By Richard A. Proctor	278
How the Bible Came to Us. By a Student of Divinity	281
A Dead World. By Richard A. Proctor	283
Evolution of Language. By Ada S. Ballin	285
Men and Apes	287
Incombustible Theatres. By Henry J. Slack	288
Composite Portraits	288
Drawing Ellipses	290
Reviews	291
Gossip. By Richard A. Proctor	293
The Face of the Sky for July. By F R A S	294
Our Whist Column. By "Five of Clubs"	295
Our Chess Column. By "Mephisto"	295

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